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H. Butler

CHAMBERS'S

ENCYCLOPÆDIA

CHAMBERS'S

ENCYCLOPÆDIA

A DICTIONARY

OF UNIVERSAL KNOWLEDGE FOR THE PEOPLE

ILLUSTRATED

WITH MAPS AND NUMEROUS WOOD ENGRAVINGS

VOL. IV

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LIST OF MAPS FOR VOL. IV.

	Page
EUROPE, ...	166
FRANCE in Departments, ...	469
MINOR GERMAN STATES, ...	717

CHAMBERS'S ENCYCLOPÆDIA

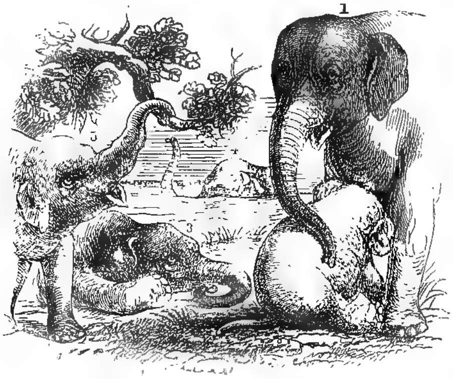
A DICTIONARY OF

UNIVERSAL KNOWLEDGE FOR THE PEOPLE

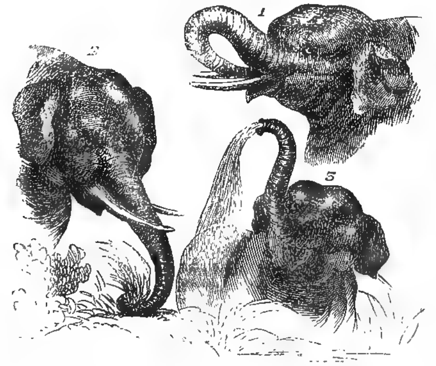
E'LEPHANT (Gr. *Elephas*), a genus of quadrupeds, of the order *Pachydermata* (q. v.), and of the section *Proboscidea*. Elephants are the largest existing land animals. The ordinary height at the shoulder is about eight feet, but sometimes exceeds ten feet. The weight of a large E. is about five tons, the body being very bulky in proportion to its height. To sustain this weight, it is furnished with limbs of colossal thickness and strength, which are also remarkably straight, each bone resting vertically on that beneath it. From the appearance of inflexibility presented by the limbs, arose the notion prevalent among the ancients, and throughout the middle ages, that the limbs are destitute of joints, and that consequently an E. cannot lie down to rest like another quadruped, and if it were to lie down, could not rise again, but always sleeps standing, or leaning against a tree. It is indeed true that the E. often sleeps standing, and when fatigued, falls asleep leaning against a rock or tree, against which it may have been rubbing itself. The flexibility of the limbs is, however, sufficient to permit elephants to run with speed nearly equal to that of a horse, to indulge in playful gambols, and to ascend and descend steep mountains. Elephants are more sure-footed and serviceable than either horses or mules, in difficult mountain roads. On the very steepest declivities, an E. works his way down pretty rapidly, even with a *howdah* and its occupants upon his back, his chest and belly on the ground, and each fore-foot employed in making a hole for itself, into which the hind foot afterwards follows it, and to which the weight may be trusted, that another step may be ventured with safety. In lying down, the E. does not bring his hind-legs under him, like the horse and other quadrupeds, but extends them backwards (as man does when he assumes the kneeling position), an arrangement which, 'by enabling him to draw the hind-feet gradually under him, assists him to rise almost without a perceptible effort.' The E.'s pace, when exceeding a walk, is neither a trot nor a gallop, which would be too violent a motion for its conformation and huge body, but a sort of shuffle, the speed of which is increased or diminished without other alteration. The E. is incapable of springing like the deer, horse, and other animals which have the bones of their shoulders and hocks set at an angle.

The head in elephants is large; the neck is short and thick, the long flexible proboscis compensating both for the shortness of the neck, and for the inflexibility caused by the largely developed processes of its vertebræ, and enabling the animal readily to reach objects on the ground, or to a height of several feet above its head, or on either side. A great extent of bony surface in the head affords attachment for muscles destined to move and give power to the proboscis or trunk. This extent of bony surface is provided in a remarkable manner, which at the same time makes the head, heavy as it is, lighter in proportion to its bulk than is usual in quadrupeds; a great space separating the internal and external tables of all the bones of the skull, except the occipital bones, so that the space occupied by the brain is but a small part of the whole head. The space between the tables of the bones is occupied by cells, some of which are four or five inches in length; others are small, irregular, and honeycomb-like; 'these all communicate with each other, and through the frontal sinuses with the cavity of the nose, and also with the tympanum or drum of each ear; consequently, as in some birds, these cells are filled with air.' The huge and extraordinary bones of the skull, besides affording attachment for muscles, afford mechanical support to the tusks.

The nasal bones of the E. are scarcely more than rudimentary; but the tapering proboscis, to the very extremity of which the nostrils are prolonged, is nearly eight feet in length. Besides the great muscles connected with it at its base, it is composed of a vast multitude of small muscles variously interlaced, but chiefly either longitudinal, and divided into successive arcs, of which the convexity is outwards, or transverse, and radiating from the internal to the external membrane. Cuvier states the number of muscles having the power of distinct action as not far short of 40,000. The trunk can be coiled around a tree, and employed to tear it from its roots; it is a formidable weapon of offence or defence, and is far more employed in this way than the tusks, even by those elephants which have tusks of great size; its extremity can be wound around a small handful of grass or a slender branch; it is even capable of plucking the smallest leaf, or of lifting a pin from the ground. To fit it for such actions as those last mentioned, and for many such as might be performed by a hand, it is furnished at the extremity with what may be likened to a finger and thumb; on the upper side, an elongated process—strong, soft, and flexible, like the rest of the trunk, and endowed with the most delicate sense of touch—on the under side, a kind of tubercle against which this process may be pressed. All the food of the E. is gathered and conveyed to the mouth by the trunk: by means of the trunk, also, it drinks, sucking up into it a quantity of water sufficient to fill it, and then discharging the contents into the mouth. Valves at the base of the trunk prevent the water from going too far up the nostrils. The trunk is constantly employed by elephants in providing in many ways for their comfort or enjoyment, as in throwing dust over their backs, or in fanning themselves and switching away flies with a leafy branch, two practices to which they are greatly addicted. Their mutual caresses are also managed by means of the trunk, and through it they make a loud shrill sound, indicative of rage, which is described by Aristotle as resembling the hoarse sound of a trumpet, and from which this organ received its French name *trompe*, corrupted in English into trunk. With the trunk also, they sometimes, when angry, beat violently on the ground.



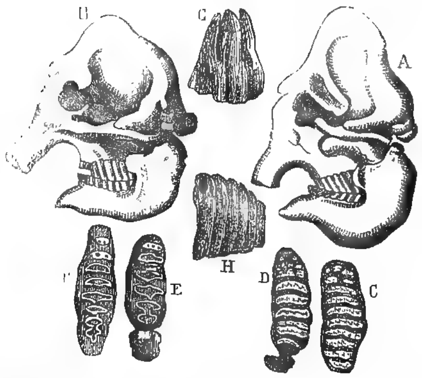
Various positions of the Elephant's Trunk:
1, female elephant suckling her young one; 2, the young one; 3, elephant reposing; 4, elephant swimming; 5, young elephant browsing.



1, elephant drinking; 2, elephant gathering long herbage; 3, elephant spouting water over its back.

The sense of smell is very acute in the E., as is also that of hearing. The ears are large and pendulous, the eyes are small.

Elephants have no canine teeth, nor have they any incisors in the lower jaw. The upper jaw is furnished with two incisors, which assume the peculiar character of tusks, and attain an enormous size, a single tusk sometimes weighing 150 or even 300 lbs. The tusks are, however, often imperfectly developed, ten or twelve inches in length, and one or two in diameter. These stunted tusks are often used for such purposes as snapping off small branches and tearing climbing plants from trees. Those elephants which possess great tusks employ them also for such other uses as loosening the roots of trees which they cannot otherwise tear from the ground; or in a state of domestication, for such labours as moving great stones, and piling or carrying timber. A powerful E. will raise and carry on his tusks a log of half a ton weight or more. The tusks of the E. surpass in size all other teeth of existing animals, and are the largest of all teeth in proportion to the size of the body. They consist chiefly of that variety of *dentine* called Ivory (q. v.), and continue to grow—like the incisors of the rodents, to which they are in some respects analogous—even when the animal has attained a great age, if not to the very end of its life. The young E. is at first furnished with deciduous incisors, which are shed between the first and second year, and are succeeded by the permanent tusks.—The molar teeth of the E. are developed in succession; and at least in the Indian E., never more than two are to be seen in the same side of a jaw at one time. The first molars cut the gum in about two weeks after birth, and are shed about the end of its second year. The sixth molars,



A, skull of Indian elephant; B, skull of African elephant; C, D, upper and lower molar teeth of Indian elephant; E, F, upper and lower molar teeth of African elephant; G, the original state of the grinders when the laminæ of which they consist are as yet unconnected together; H, the laminæ as they are attached in parallels one to the other by cortical substance.

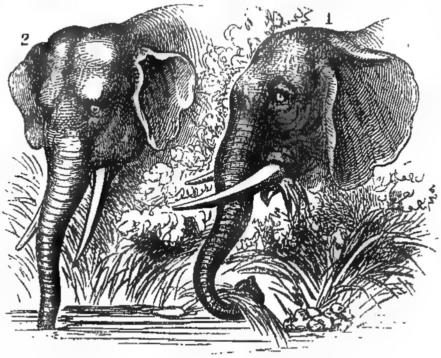
which are also believed to be the last, are supposed to appear about the fiftieth year of the E.'s life. The molar teeth of the E. are remarkable for their great size, and for the extreme complexity of their structure, to which the nearest resemblance is found in some of the small rodents. They are composed of vertical plates of bony substance, separately enveloped with enamel, and cemented together by a third substance, called *crusta petrosa*, *cortical*, or *cement*, more resembling bone than enamel. Each succeeding tooth is not only more complex, but occupies a greater space in the jaw than its predecessor. Although formed from a single pulp, the molar tooth of an E. resembles an aggregation of teeth; and in the earlier stages of its growth, when the cement is not yet deposited, it seems as if many separate teeth were soldered together. As the surface of the tooth is worn down by mastication, the harder enamel is exposed in elevated ridges. The whole of a tooth is not in employment at once. From the peculiar manner of its growth, the anterior part begins to be employed, and to be worn away, whilst the latter part is still in process of formation.

The digestive apparatus of the E. is similar to that of the other pachydermata; but the stomach, which is of a very lengthened and narrow form, exhibits a peculiarity which assimilates it to that of the camel; the internal membrane, at the extremity beyond the cardiac orifice, forming thick wrinkles and folds, the broadest of which, and nearest to the gullet, seems to act as a valve, making that end of the stomach a reservoir for water, capable of containing about ten gallons; whilst a peculiar muscle, connecting the windpipe and gullet, enables the animal to open this reservoir at pleasure, for the regurgitation of the fluid, which is then sometimes received into the trunk, and squirted over the body, to free it from the nuisance of flies, or the heat of a tropical sun.

The female E. has only two teats, situated between the fore-legs. The young suck with the mouth, and not with the trunk. They are suckled for about two years. The period of gestation is also nearly two years, and a single young one is produced at a birth.

The skin of the E. is very thick, of a dark-brown colour, and in the existing species, has scarcely any covering of hair. The tail does not reach to the ground, and has a tuft of coarse bristles at the end. The feet have in the skeleton five distinct toes, but these are so surrounded with a firm horny skin, that only the nails are visible externally, as on the margin of a kind of hoof. The foot of the E. is admirably adapted for steep and rough ground, the protective skin which covers the toes allowing them considerable freedom of motion.

Only two existing species of E. are certainly known, the Indian (*E. Indicus*) and the African (*E. Africanus*), although differences have recently been observed in the E. of Sumatra, which may perhaps entitle it to be ranked as a distinct species. Elephants are found in all parts of Africa, from the Sahara southwards, where wood and water are sufficiently abundant; also throughout India and the south-eastern parts of Asia, and in some of the tropical Asiatic islands. They extend northwards to the Himalaya; and Chittagong and Tiperah vie with Ceylon in the superior excellence of the elephants which they produce. The Indian E. is distinguished by a comparatively high oblong head, with a concave forehead; whilst the African has a round head and convex forehead. The ears of the African E. are much larger than those of the Indian, covering the whole shoulder, and descending on the legs. A marked distinction of the two species is also found in the molar teeth; those of the Indian E. exhibiting *wavy parallel transverse ridges;* whilst those of the African species have the divisions of the crown of the tooth fewer, broader, and *lozenge-shaped.*



1, head of African elephant; 2, head of Asiatic elephant.

Elephants live in herds, not generally numerous, but several herds often congregate together in the same forest or at the same place of drinking. Each herd has a leader, generally the largest and most powerful animal. The leader seems to exercise much control over the movements of the herd, gives the alarm in case of danger, and seems to examine and decide for the whole herd as to the safety of proceeding in any particular direction. On account of his tusks, the leader is very often the animal against which the efforts of the hunter are directed; but the rest of the herd do their utmost to protect him, and when driven to extremity, they place him in the centre, and crowd so eagerly to the front of him that some of them must often be shot ere he can be reached. A family resemblance is usually very visible among the elephants of the same herd; some herds are distinguished by greater stature, and others by more bulky form and stronger limbs; some by particularly large tusks, some by slight peculiarities of the trunk, &c. In the East Indies, distinctions of this kind have long been carefully noticed, and particular names are given to elephants according to them, some being considered as *high-caste*, and others as *low-caste* elephants. An E. which by any cause has been separated from its herd, seems never to be admitted into another, and these solitary elephants are particularly troublesome, in their depredations exhibiting an audacity which the herds never exhibit; they are also savage and much dreaded, whilst from a herd of elephants danger is scarcely apprehended. The E. is generally one of the most inoffensive of animals, although in a state of domestication, it shews, as is well known, a power both of remembering and resenting an injury.

The favourite haunts of wild elephants are in the depths of forests—particularly in mountainous regions—where they browse on branches, and from which they issue chiefly in the cool of the night to pasture in the more open grounds. They are ready to plunder rice or other grain-fields, if not deterred by fences, of which, fortunately, they have, in general, an unaccountable dread, even although rather imaginary than real. A fence of mere reeds will keep them out of fields, where, as soon as the grain is removed, they enter by the gaps of the fence, and may be seen gleaning among the stubble.

When the E. eats grass, 'nothing can be more graceful than the ease with which, before conveying it to his mouth, he beats the earth from its roots by striking it on his fore-leg.' A cocoa-nut is first rolled under foot, to detach the outer bark, then stripped of the fibrous husk, and finally crushed between the grinders, when the fresh milk is swallowed with evident relish. The fruit of the palmyra palm is another favourite food of elephants, and they seem to have an instinctive knowledge of the time of its ripening. Sugar-canes are also a favourite food; indeed, elephants are very fond of sweet things. Those which are brought to Britain are generally fed on hay and carrots. The amount of daily food necessary for the E. in a state of domestication may be stated, on an average, at about two hundred pounds in weight.

Elephants delight in abundance of water, and enter it very freely, often remaining in it for a considerable time and with great evident enjoyment. They sometimes swim with not only the body but the head under water, the only part elevated above it being the extremity of the trunk.

The habits of the African E. appear in no important respect to differ from those of the Indian elephant. It is the latter only that is at the present day domesticated; but it is certain that the African species was anciently domesticated, and the figures on many Roman medals attest it.

Elephants rarely breed in a state of domestication, although, a few years ago, the birth of an elephant took place in the Zoological Gardens of London, an occasion of much interest not only to the scientific but to the general public. They are generally tamed within a few months after they are captured; some degree of severity being employed at first, which, however, as soon as the animal has begun to respect the power of man, is exchanged for kindness and gentleness of treatment. Elephants intended for domestication are captured in various ways. It was formerly common to take them in pitfalls, but in this way they were often much injured. Another method frequently practised is by the aid of tame elephants. Male elephants chiefly are captured in this way, the decoy elephants employed being females, trained for the purpose. With these the hunters very cautiously approach the animal they mean to capture, and he generally permits them to come up to him, and is so pleased to make the acquaintance of the females, that he takes no notice of their riders and other human attendants. Two of the females take their places, one on each side of him, and whilst he is occupied with them, men, the profession of whose lives it is, and who display a wonderful expertness in the work, contrive to get beneath their bodies, and to pass ropes round the legs of the intended captive. His two hind-legs are fastened together by six or eight ropes in the form of the figure 8, another rope keeping them tight at the intersections, and a strong cable with a running-noose is attached to each hind-leg. About twenty minutes are usually spent in fixing the necessary ropes, profound silence being maintained if the process goes on unobserved, or some of the other hunters distracting the attention of the E. from those who are engaged in this work; and when at last, becoming sensible of his danger, he tries to retreat, an opportunity is soon found of tying him, by means of the long cables which trail behind him, to some tree strong enough for the purpose. His fury then becomes ungovernable, and he makes violent and prodigious efforts to get free, throwing himself on the ground, and twisting himself into the most extraordinary positions. It is not until he has thoroughly exhausted himself, and begins to suffer severely from fatigue, thirst, and hunger, that the next steps are taken towards taming him and making him a willing servant of man.

Still more wonderful is the capture of a wild E., sometimes by not more than two hunters, who for this purpose will go into the woods, without aid or attendants, their only weapon a flexible rope of hide. With this they secure one of the E.'s hind-legs, following his footsteps when in motion, or stealing close up to him when at rest, or sometimes spreading the noose on the ground, partially concealed by roots and leaves, beneath a tree on which one of the party is stationed, whose business it is to lift it suddenly by means of a cord. When arrested by the rope being coiled around a tree, the E. naturally turns upon the man who is engaged in making it fast, but his companion interferes on his behalf, by provoking the animal; and thus not only is the first rope made fast, but noose after noose is passed over the legs, until all are at last tied to trees, and the capture is complete; upon which the hunters build a booth for themselves in front of their prisoner, kindle their fires for cooking, and remain day and night till the E. is sufficiently tamed to be led away.

But these huge animals are not always captured singly; whole herds are often taken at once. This is accomplished by means of an enclosure, towards which the elephants are driven by great numbers of men encircling a considerable space, and contracting the circle by slow degrees. Weeks, or even months, are spent in this operation, and at last the elephants, hemmed in on every side except the mouth of the enclosure, enter it, and the gate is immediately closed. The modes of constructing the enclosure are different in different parts of the East. Tame elephants are sometimes sent into it, and the captives are in succession made fast to trees there, in a way somewhat similar to that practised in capturing single elephants.

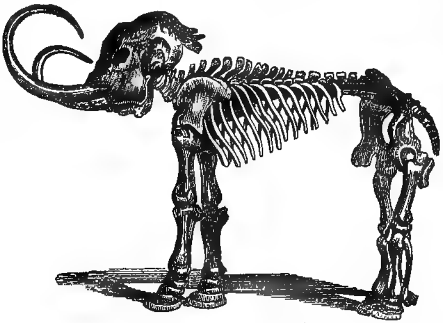
The E. first became known in Europe from its employment in the wars of the East: 'in India, from the remotest antiquity, it formed one of the most picturesque, if not of the most effective, features in the armies of the native princes.' Elephants have been taught to cut and thrust with a kind of scimitar carried in the trunk, and it was formerly usual for them to be sent into battle, covered with armour, and bearing towers on their backs, which contained warriors. But the principal use of the E. in war is for carrying baggage, and for dragging guns. An E. will apply his forehead to a cannon, and urge it through a bog, through which it would be almost impossible for men and cattle to drag it; or he will wind his trunk round it, and lift it up, whilst horses or cattle drag it forwards. Elephants are used in the East for carrying persons on their backs, a number being seated together in a *howdah*, whilst the driver (*mahout*) sits on the E.'s neck, directing it by his voice and by a small goad. Elephants have always a conspicuous place in the great processions and state displays of eastern princes, and white elephants—albinos—are peculiarly valued. Elephants are also employed in many kinds of labour, and display great sagacity in comprehending the nature of their task and adapting themselves to it. In piling timber, the E. 'manifests an intelligence and dexterity which is surprising to a stranger, because the sameness of the operation enables the animal to go on for hours disposing of log after log, almost without a hint or direction from his attendant.'

Of the sagacity of the E., many interesting anecdotes are on record, as every reader of books of travels and of natural history knows. But Cuvier refuses, and apparently with justice, to ascribe to it a degree of sagacity higher than that of the dog. In a state of domestication, the E. is a delicate animal, requiring much watchfulness and care, although naturally it has a very long life, and instances are on record of extreme longevity in domestication, extending not only to more than one hundred, but almost to two hundred years.

The numbers of wild elephants in some parts both of the East Indies and of Africa, are being gradually reduced as cultivation extends, and many are shot for no other reason than a desire to reduce their numbers, and put an end to their ravages on cultivated grounds. A reward of a few shillings per head was claimed for 3500 destroyed in part of the northern province alone of Ceylon, in less than three years prior to 1848. It is for the sake of ivory that the greatest slaughter of elephants takes place. A ball of hard metal, skilfully planted in the eye, base of the trunk, or behind the ear, generally ends an E.'s life in an instant; and expert *sportsmen* have been known to kill right and left one with each barrel.

Fossil Elephants.—The E. makes its appearance in the Pleistocene strata. Its near ally, the mastodon, whose remains are found associated with it, began life earlier; it has left its traces in Miocene deposits. Ten species of fossil elephants have been described, the remains of three of which are found in Europe. The best known of these is the *Elephas primigenius*, or Mammoth, the tusks of which are so little altered as to supply an ivory which, though inferior to that of the living species, is still used in the arts, especially in Russia. Its tusks are, on this account, regularly searched for by 'ivory hunters' in Siberia, where, in the superficial deposits of sand, gravel, and loam, the remains occur in enormous abundance. They are also found in similar strata all over Europe. In Britain, the localities that have supplied these remains are very numerous. They are especially abundant in the Pleistocene deposits of the east and south-east of England. Woodward, in his *Geology of Norfolk*, calculates that upwards of 2000 grinders of this animal have been dredged up by the fishermen off Happisburgh in thirteen years. The bone-caves also yield remains of this gigantic animal.

The mammoth truly belongs to the geological history of the world; it died out at the close of the period represented by the Pleistocene beds. It is the only fossil animal that has been preserved in a perfect condition for the examination of man. In all other remains we have to deal with the hard portions only—the bones, teeth, scales, &c., and frequently only with fragmentary portions, requiring the skill of a Cuvier or an Owen to make from them an approximation to the perfect animal. But the mammoth has been preserved so that its flesh has been eaten by dogs, bears, and wolves. In 1799, a Tungusian, named Schumachoff, while searching along the shores of Lake Oncoul for mammoth tusks, observed among the blocks of ice a shapeless mass, but did not at the time discover what it was. The heat of succeeding summers gradually melted the ice around it, and, in 1803, the mammoth fell on a bank of sand. In March of the following year, the hunter visited it, cut off, and carried away the tusks, which he sold for fifty rubles. In 1806, Mr Adams visited the locality, and examined the animal, which still remained on the sand-bank where it had fallen, but in a greatly mutilated condition. The Jakutski of the neighbourhood had cut off the flesh to feed their dogs, and the wild beasts had almost entirely cleared the bones. The skeleton was, however, entire, excepting one of the fore-legs, and some of the bones of the tail. Many of the bones were still held together by the ligaments and by parts of the skin. The head was covered with dry skin; one of the ears was well preserved; it was furnished with a tuft of hairs. Three-fourths of the whole skin were procured, which was so heavy that ten persons found great difficulty in transporting it to the shore, a distance of 150 feet; it was of a dark-gray colour, and was covered with a reddish wool, and long black hairs or bristles. The wool was short, and curled in locks; the bristles were of different lengths, varying from 1 to 18 inches. Some of this covering still remained attached to the skin, but the great mass was entirely separated from it. Mr Adams collected 36 pounds, although much of it had been destroyed from the dampness of the place where it had lain so long. The animal was a male, and had a long mane on the neck. The entire carcass was removed to St Petersburg, where it is now preserved. The tusks were repurchased, and added to the animal. It measures from the forepart of the skull to the end of the mutilated tail 16 feet 4 inches; the height to the top of the dorsal spines is 9 feet 4 inches; the length of the tusks along the curve is 9 feet 6 inches. Portions of the hairy covering have been brought to this country, and may be seen in the British Museum.



Skeleton of Mammoth.

Taking the teeth as exhibiting clearly a marked difference in the recent species, the mammoth is easily separated from both by its broader grinders, which have narrower, and more numerous, and close-set plates and ridges. The existence of the E. and other genera, whose representatives are now found only in the warmer regions of the earth, in the north of Europe and Asia, led to the belief, that at the recent period in the world's history when they were its living inhabitants, a tropical temperature existed in the temperate zone, and stretched further north towards the pole; but the discovery of this perfect animal shewed that these huge elephants were adapted by their clothing to endure a cold climate, and by the structure of their teeth were able to employ as food the branches and foliage of the northern pines, birches, willows, &c. There are few generalisations more plausible at first sight than to predicate of an unknown species of a genus what is ascertained regarding the known members of the same genus. It required a striking case, such as that supplied by the discovery of the mammoth, to shew clearly the fallacy of deductions which were almost universally received by scientific men not many years ago, which still occasionally mislead, and which may even now be met with in some popular hand-books of science.

ELEPHANT. An order of the elephant was instituted in Denmark, by King Frederick II. The badge was a collar of elephants towered, supporting the king's arms, and having at the end the picture of the Virgin Mary.

ELEPHA′NTA, an island of six miles in circuit, stands in the harbour of Bombay (q. v.), about seven miles to the east of that city, and about five miles to the west of the mainland. It takes this its European name from a huge figure of an elephant near its principal landing-place, which, however, appears to have gradually crumbled away. This colossal animal has been cut out of a detached rock, which is apparently of basaltic origin. Further towards the interior, three temples, dug out of the living mountain, present themselves—the roofs being supported by curiously wrought pillars of various forms and magnitudes, and the walls being thickly sculptured into all the varieties of Hindu mythology. The largest of the three excavations is nearly square, measuring 133 feet by 130½ feet; and immediately fronting its main entrance stands a bust or third-length of a three-headed deity, with a height of 18 feet, and a breadth of 23. These monuments of superstition, like the quadruped which guards, as it were, the approaches to them, are said to be rapidly decaying—a state of things which, besides in some measure accounting for the execution of such works, seems to be inconsistent with any very high antiquity. The island is in lat. 18° 57′ N., and long. 73° E.

ELEPHANTI′NÉ, a small island of the Nile, lying opposite to Assouan (q. v.), the ancient Syene, on the confines of Egypt and Nubia, in 24° 5′ N. lat., and 32° 34′ E. long. From this island, the Greek mercenaries were sent by Psammitichus I. to recall the Egyptian deserters, and it was garrisoned in the time of the Pharaohs, Persians, and Romans. The island was anciently called *Abu*, or the 'ivory island,' from its having been the entrepôt of the trade in that precious material. The most important ruins are a gateway of the time of Alexander, and a small temple dedicated to Khnum, the god of the waters, and his contemplar deities, Anucis and Sate. This temple was founded by Amenophis III., and embellished by Rameses III. Another remarkable edifice is the ancient Nilometer, formerly mentioned by Strabo, and which appears to have been built in the time of the Cæsars; and several remaining inscriptions record the heights of inundation from the time of Augustus to Severus. This island had the honour of giving a dynasty (the 5th) to Egypt, and was evidently an important place, the inscriptions on the rocks attesting the adoration paid by Sethos I., Psammitichus II., and other monarchs, to the local deities. Other interesting monuments have been found on this island; amongst which may be cited part of a calendar recording the rise of the Dog-star in the reign of Thothmes III. (1445 B.C.), and numerous fragments of pottery—principally receipts in the Greek language—given by the farmers of the taxes in the reign of the Antonines. The island is at present inhabited by Nubians.—Wilkinson, *Topography of Thebes*, p. 460; Champollion, *Notice Descriptive*, p. 215; Champollion, *Lettres Ecrites*, pp. 111, 157, 171, 382.

ELEPHANT'S FOOT, or **HOTTENTOT'S BREAD** (*Testudinaria elephantipes*), a plant of the natural order *Dioscoreaceæ*, of which the root-stock forms a large fleshy mass, curiously truncate, or abruptly cut off at the end, so as somewhat to resemble an elephant's foot, and covered with a soft, corky, rough, and cracked bark. From this springs a climbing stem, which bears the leaves and flowers. The root-stock is used as food by the Hottentots. The plant is not unfrequently to be seen in hothouses in Britain.

The name ELEPHANT'S FOOT (*Elephantopus*) is also given, on account of the form of the root-leaves, to a genus of plants of the natural order *Compositæ*, sub-order *Corymbiferæ*, one species of which (*E. scaber*) is common in elevated dry situations in all parts of India, and is used in Indian medicine in affections of the urinary organs.

ELETTA′RIA. See CARDAMOM.

ELETZ. See IELETZ.

ELEUSINE, a genus of Grasses, chiefly natives of India and other warm climates, several of which are cultivated as grains. This is especially the case with *E. corocana*, an Indian species, called Natchnee and Nagla Ragee, also Mand and Murwa, which has aggregated digitate spikes finally incurved. The Tibetans make a weak sort of beer, much in use amongst them, from this grain. *E. stricta* is cultivated as a grain-crop in the same parts of the world, and is, like the former, extremely productive. The grain called Tocusso in Abyssinia is also a species of this genus, *E. Tocusso*.—A decoction of *E. Ægyptiaca* is used in Egypt for cleansing ulcers; and a drink made from the seeds is regarded as useful in diseases of the kidneys and bladder. A decoction of *E. Indica* is also administered to infants in Demerara, to prevent or cure convulsions.

ELEUSI′NIAN MY′STERIES, the sacred rites with which the annual festival of Ceres was celebrated at Eleusis. Many traditions were afloat in ancient times as to the origin of this festival. Of these, the most generally accepted was to the effect that Ceres, wandering over the earth in quest of her daughter Proserpine, arrived at Eleusis, where she took rest on the *sorrowful stone* beside the well Callichorus. In return for some small acts of kindness, and to commemorate her visit, she taught Triptolemus the use of corn on the Rharian plain near the city, and instituted the mystic rites peculiarly known as hers. The outward method of the celebration of these mysteries is known with considerable accuracy of detail. Their esoteric significance is very variously interpreted. The ancients themselves generally believed that the doctrines revealed to the initiated gave them better hopes than other men enjoyed, both as to the present life and as to a future state of existence. Modern speculation has run wild in the attempt satisfactorily to explain these mysteries. As reasonable a solution as any other seems to be that of Bishop Thirlwall, who finds in them 'the remains of a worship which preceded the rise of the Hellenic mythology and its attendant rites, grounded on a view of nature, less fanciful, more earnest, and better fitted to awaken both philosophical thought and religious feeling.' The festival itself consisted of two parts, the greater and the lesser mysteries. The less important feast, serving as a sort of preparation for the greater, was held at Agræ, on the Ilissus. The celebration of the great mysteries began at Eleusis on the 15th day of Boëdromion, the third month of the Attic year, and lasted over nine days. On the first day (called *agurmos*, the assembling), the neophytes, already initiated at the preparatory festival, met, and were instructed in their sacred duties. On the second day (called Haladé, mystæ, *To the sea, ye initiated!*), they purified themselves by washing in the sea. On the third day, sacrifices, comprising, among other things, the mullet-fish, and cakes made of barley from the Rharian plain, were offered with special rites. The fourth day was devoted to the procession of the sacred basket of Ceres (the Kalathion). This basket, containing pomegranates, salt, poppy-seeds, &c., and followed by bands of women carrying smaller baskets similarly filled, was drawn in a consecrated cart through the streets, amid shouts of 'Hail, Ceres!' from the onlookers. The fifth day was known as the 'day of the torches,' and was thought to symbolise the wanderings of Ceres in quest of her daughter. On it the mystæ, led by the 'daduchus,' the *torch-bearer*, walked two by two to the temple of the goddess, and seem to have spent the night there. The sixth day, called Iacchus, in honour of the son of Ceres, was the great day of the feast. On that day the statue of Iacchus was borne in pomp along the sacred way from the Ceramicus at Athens to Eleusis, where the votaries spent the night, and were initiated in the last mysteries. Till this stage of the proceedings, they had been only *mystæ*; but on the night of the sixth day they were admitted into the innermost sanctuary of the temple, and, from being allowed to behold the sacred things, became entitled to be called 'epoptæ,' or 'ephori;' i. e., *spectators*, or *contemplators*. They were once more purified, and repeated their original oath of secrecy with an imposing and awful ceremonial, somewhat resembling, it is believed, the forms of modern free-masonry. On the seventh day, the votaries returned to Athens with mirth and music, halting for a while on the bridge over the Cephisus, and exercising their wit and satire against the spectators. The eighth day was called Epidauria, and was believed to have been added to the original number of the days for the convenience of those who had been unable to attend the grand ceremonial of the sixth day. It was named in honour of Æsculapius, who arrived on one occasion from his native city of Epidaurus too late for the solemn rites, and the Athenians, unwilling to disappoint so distinguished a benefactor of mankind, added a supplementary day. On the ninth day took place the ceremony of the 'Plemochoæ,' in which two earthen vessels filled with wine were turned one towards the east, and the other towards the west. The attendant priests, uttering some mystic words, then upset both vessels, and the wine so spilt was offered as a libation.

Initiation into the Eleusinian mysteries was compulsory on every freeborn Athenian; but slaves, prostitutes, and persons who had forfeited their citizenship were excluded from the rites. During the period of the festival, none of those taking part in it could be seized or arrested for any offence. Lycurgus, with a view to destroying distinctions of class, forbade any woman to ride to the Eleusinia in a chariot, under a penalty of 6000 drachmæ. The mysteries were celebrated with the most scrupulous secrecy. No initiated person might reveal what he had seen under pain of death, and no uninitiated person could take part in the ceremonies under the same penalty. The priests were chosen from the sacred family of the Eumolpidæ, whose ancestor, Eumolpus, had been the special favourite of Ceres. The chief priest was called the 'Hierophant,' or 'Mystagogue;' next in rank to him was the Daduchus, or Torch-bearer; after whom came the 'Hiero-Ceryx,' or Sacred Herald, and the priest at the altar. Besides these leading ministers, there was a multitude of inferior priests and servants.

ELEU'SIS, a celebrated town in ancient Attica, stood near the northern shore of the Gulf of Salamis, and not far from the confines of Megaris. It was famous as the chief seat of the worship of Ceres, whose mystic rites were here performed with great pomp and solemnity from the earliest authentic times till the era of Alaric. See Eleusinian Mysteries. The temple of the goddess, designed by Ictinus, the architect of the Parthenon, was the largest sacred edifice in Greece. The site of the old Eleusis is now occupied by the little village of Lefsina or Lepsina.

ELEU'THERA, one of the Bahamas (q. v.), is, next to New Providence, the most populous island in the whole chain. Including its dependent *cayos* or *keys*, E., in 1851, contained 4610 inhabitants. It is more fertile than most of its neighbours, more especially surpassing all of them in the growth of fruit, such as the pine-apple, the orange, and the lemon.

ELEUTHE'RIA BARK, a name not unfrequently given to the bark of the *Croton Eleutheria*, also known as Cascarilla Bark. See Cascarilla. It is called Eleutheria (or Eleuthera) Bark, because it is chiefly gathered on the island of Eleuthera.

E'LEVATED. Wings turned upwards are described in heraldry as elevated.

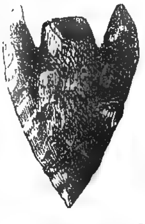
ELEVA'TION, in Architectural Drawing, is a representation of the flat side of a building, drawn with mathematical accuracy, but without the slightest attention to effect. In Art, again, elevation is a raising of the subject beyond its ordinary character in real life. A very good instance of elevation in this sense is given by Fairholt in his *Dictionary of Terms in Art*, in Rembrandt's 'Adoration of the Shepherds.' The whole of the objects and surroundings of the infant Saviour are of the most homely description; and still the light which is represented as issuing from his person gives an elevation to the scene which takes off from it entirely the character of being commonplace or vulgar.

ELEVATION, in Astronomy and Geography, means generally the height above the horizon of an object on the sphere, measured by the arc of a vertical circle through it and the zenith. Thus, the elevation of the equator is the arc of a meridian intercepted between the equator and the horizon of the place. The elevation of the pole is the complement of that of the equator, and is always equal to the latitude of the place. The elevation of a star, or any other point, is similarly its height above the horizon, and is a maximum when the star is on the meridian.

ELE'VENTH, in Music, is the interval of the octave above the fourth.

ELF, a fairy, pl. **ELVES**. See Fairies.

ELF-ARROW-HEADS, ELFIN-ARROWS, ELF-BOLTS, ELF-DARTS, ELF-SHOT, and **ELF-STONES**, names popularly given in the British Islands to the arrow-heads of flint which were in use at an early period among the barbarous tribes of this country and of Europe generally, as they are still in use among the American Indians, the Esquimaux of the Arctic regions, and the inhabitants of some of the islands in the Pacific Ocean. It was believed that elves or fairies, hovering in the air, shot these barbs of flint at cattle, and occasionally even at men. Thus, Robert Gordon of Straloch, an accomplished country gentleman of the north of Scotland, writing in 1654, tells how one of his friends, travelling on horseback, found an elf-arrow-head in the top of his boot, and how a gentlewoman of his acquaintance, when out riding, discovered one in the breast of her habit. He remarks that, although they are got by chance in the fields and on the highways, one who goes to look for them on purpose will search in vain. He adds that they are most commonly met with after showers—a circumstance which probably helped them in Germany to their names of 'thunder-bolts' and 'thunder-stones,' and is easily enough explained. The rain, by washing away the earth in which they



Elf-Arrow-Head.

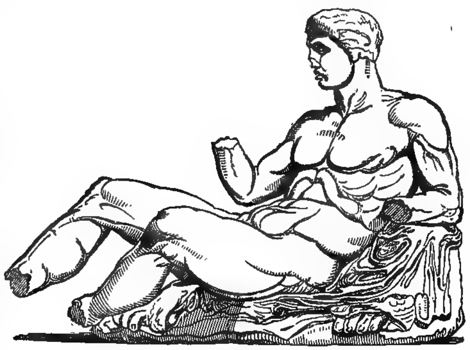
have been imbedded, makes them more readily perceptible to the eye, especially if the sunshine happens to fall upon them. Cattle dying suddenly in the fields were believed to have been struck by elf-arrows—a belief which yet lingers in Ireland, and perhaps in some secluded parts of Scotland. 'Thus, when cattle are sick,' writes Mr W. R. Wilde, in his *Catalogue of the Antiquities in the Museum of the Royal Irish Academy* (Dub. 1857), 'and the cattle doctor, or fairy doctor, is sent for, he says the beast has been "elf-shot," or stricken by fairy or elfin darts; and he forthwith proceeds to feel the animal all over; and, by some legerdemain, contrives to find in its skin one or more poisonous weapons, which, with some coins, are then placed in the water which is given it to drink; and so a cure is said to be effected.' The elf-arrow-head was occasionally set in silver, so as to be worn on the person as a talisman, or had a hole drilled through it, so that it might be dipped in water, which, being thus endowed with healing virtue, was used sometimes as a wash, more commonly as a draught. As a talisman, the elf-arrow-head was believed to be most efficacious as a preservative from poison and witchcraft. The ascription of the flint arrow-head to the elves or fairies, is but one of several instances of the disposition of a people to elevate or degrade the earlier races whom they vanquished or dispossessed into mythical beings, better or worse than mankind. Thus, in Greece and Italy, the remains of the rude strongholds built by the Pelasgi came to be regarded as works of the fabled Cyclops, or one-eyed giants. So also, in Scotland, the sepulchral mounds of the aboriginal inhabitants were called 'elf-hillocks;' and the vestiges of ancient ploughshares which may be traced on heaths and hill-tops were called 'elfin-furrows.' Examples of 'elf-arrow-heads' may be seen in most museums of antiquities. They fall to be more particularly described in a following page, under the head of Flint Implements and Weapons.

E'LGIN, a royal burgh, the county town of Elgin or Morayshire, and a station on the Inverness and Aberdeen Junction Railway, situated on the right bank of the river Lossie, about five miles from the sea. Pop. (1861) 7543. E. joins with Banff, Peterhead, Inverury, Cullen, and Kintore, in returning a member to parliament. It was probably a royal burgh so early as the reign of King David I. (1124—1153), and had its privileges confirmed by several of his successors. Its trade is now almost wholly retail. E. has 12 yearly fairs, and a weekly grain market. It has a parish church, which is collegiate, 2 Free Churches, 2 United Presbyterian Churches, 1 Baptist Church, 1 Original Secession, 1 Independent, 1 Episcopal, and 1 Roman Catholic; with 10 schools. Gray's Hospital for the sick poor, built and endowed from a bequest of £20,000 by the late Dr Alexander Gray of Bengal, and opened in 1819, with a small pauper lunatic asylum since attached by public subscription; and the Elgin or Anderson's Institution for the support of old age and the education of youth, built and opened 1831—1833, on the foundation of £70,000 bequeathed by the late Major-general Anderson, H.E.I.C.S.—are the principal of many public and private charities. E. is chiefly remarkable for the beauty of its situation, lying placidly in a gentle curve of the Lossie, for the salubrity of its climate, and for its history as the see of the Bishop of Moray. Its appearance, about fifty years ago, was that of a little cathedral city with an antique fashion of building, and with 'a certain solemn drowsy air about the town and its inhabitants.' That appearance is fast giving way to that of a gay modern county town, surrounded by elegant villas. The old town was partially burned in 1390 by the notorious Wolf of Badenoch (Alexander Stewart, Earl of Buchan); in 1402, by Alexander, the son of the Lord of the Isles; and in 1452, by the Earl of Huntly—this last calamity originating the proverb, 'Half done, as Elgin was burned.' Its once magnificent cathedral church, partly of Early English and partly of Middle-pointed architecture, dedicated to the Holy Trinity, was begun by Bishop Andrew Moray in 1224, on the transference of the see from Spynie; was injured by fire in 1270; was nearly burned down by the Wolf of Badenoch in 1390; was restored under Bishops Bur, Spyny, Innes, and Leighton (1390—1424); and from subsequent accident and dilapidation is now a mere ruin. The other religious buildings of the olden time were the church of St Giles, a picturesque example of our old parish churches, replaced 1826—1828 by the modern less interesting structure; the monastery of the Black Friars, long since demolished; the convent of the Gray Friars, the walls of whose church remain; the hospital of the Maison Dieu, on the site of which is Anderson's Institution; the Leper House, still commemorated by the grounds called the Leper Lands; and the chapel of St Mary of the Castle, which gave name to the Lady Hill and Lady Well on the west of the town. The castle itself, styled of old the Manor of Elgin, whose ruins, surmounted by an obelisk—erected to the memory of George, fifth and last Duke of Gordon—crown the Lady Hill, was a residence of the Earls of Moray, for some time superiors of the burgh under our Scottish kings.

ELGIN AND KINCA'RDINE, Earl of, Governor-general of India. James Bruce, eighth Earl of E., was born in Park Lane, London, in 1811. He was educated at his father's seat in Fifeshire, and afterwards went to Christ Church, Oxford, where he was first-class in classics, 1832; became Fellow of Merton, and graduated M.A. 1835. He entered public life in 1841, when, as Lord Bruce, he was returned at the general election on the Conservative interest for Southampton. A petition was presented against the return, and the election was declared void. Before, however, a new writ could issue, Lord Bruce had succeeded his father (who enriched the British Museum by the invaluable collection of sculpture known as the 'Elgin Marbles,' q.v.) as Earl of Elgin. Those who remember his early parliamentary and pre-colonial career, state that he gave early promise of oratorical distinction, and assert that if he had thrown himself into the politics of the day, he would have taken a high position as a parliamentary debater. By succeeding to a Scotch peerage, however, he was, in his own words, 'expelled from the House of Commons without being admitted into the House of Peers.' Being offered the governorship of Jamaica, in March 1842, by the Earl of Derby—then Lord Stanley—he went to Jamaica, where he administered the affairs of the island with so much ability and success, that in August 1846, the Governor-generalship of Canada was tendered to him by Earl Grey, then Secretary of State for the Colonies in the administration of Lord J. Russell. Lord E., still finding himself in the same position as a Scottish peer, accepted the office, and went to Canada. His administration of the government of Canada will ever be a bright spot in our colonial history, and a model to future governors of English dependencies. He found Canada governed by cliques, and torn by intestine feuds. With admirable tact and entire success, he inaugurated a system of self-government, which has rendered the provinces of British America a support to the British throne, in place of being a source of weakness. Under his government, Canada made such strides in importance and prosperity, that between 1847 (in the beginning of which year he entered upon his government) and 1855, when he returned to England, the revenue of that great British possession quadrupled itself. During his administration, he successfully negotiated a treaty for reciprocity of trade between British America and the United States, which admitted the whole produce of British North America to be brought into competition with the products of the United States in their own markets. This treaty likewise put an end to the risk of collision on the subject of the fisheries between this country and America, which Lord E. has described as the most serious risk which had presented itself during the whole time he had been a public servant. His popularity was great, not only in Canada but the adjacent states, the citizens of which offered him ovations. He was now a peer of the United Kingdom (having been summoned to the House of Lords in 1849), and was appointed lord-lieutenant of Fifeshire. In 1857, the affair of the lorcha *Arrow*, and the bombardment of Canton by Sir John Bowring, led Lord Palmerston to invite Lord E. to go to China as Plenipotentiary Extraordinary. An army was equipped to carry out the policy prescribed by the British government, and he started on his mission. But before he could approach his destination, and when he had barely left England a month, the Indian mutiny broke out. Lord E. did not hesitate a moment in preferring the safety of India to the success of his Chinese negotiations. He despatched the Chinese expedition to Lord Canning's assistance, and the English in India were thus enabled to hold their ground until further reinforcements arrived. After thus consigning himself to an inaction of several months, Lord E. proceeded to China, and in 1858, in conjunction with Baron Gros, the French plenipotentiary, he negotiated the treaty of Tien-tsin, which promised to give Great Britain a freer access to China than she had ever enjoyed before. He found time, before his return, to negotiate a treaty with Japan, under which English manufactures are admitted at low rates of duty, and a British minister is permitted to reside at Jeddo. On his return home, he was appointed Postmaster-general. He had scarcely time to become acquainted with his duties, before the treachery of the Chinese, in firing upon the British squadron from the Taku forts, led to the organisation of another Chinese expedition, and to Lord E.'s second mission to China. A combined English and French force penetrated to the capital, and enabled Lord E. and Baron Gros to dictate a peace under the walls of Pekin. On the expiration of Viscount Canning's term of service, the governor-generalship of India was offered by Lord Palmerston to Lord E. (1861), and accepted by him. Lord E. (who is the representative in the male line of the great Scottish House of Bruce) has been twice married: in 1841, to the daughter of Mr Cumming Bruce, M.P. (she died 1843); and in 1846, to the daughter of the first Earl of Durham, by whom he has a son, Victor Alexander Lord Bruce, born at Montreal 1849, and other issue. Lord E. is K.T. (1847), privy councillor (1857), G.C.B. (civil, extra) 1858.

ELGIN MARBLES, a celebrated collection of ancient sculptures, brought from Greece by Thomas, seventh Earl of Elgin, and acquired from him by the nation for the British Museum in 1816, at the sum of £35,000.

These sculptures adorned certain buildings on the Acropolis of Athens; the chief portions, which are from the Parthenon or Temple of Minerva, were designed by Phidias, and executed by him, or under his superintendence. They consist of—1. Portions of several of the statues that were placed in the east and west tympana or pediments, the most important of which are the Theseus or Hercules, Ilissus or river-god, upper portions of the torsos of Neptune and Minerva, Iris, torso of Cecrops, Ceres, and Proserpine, the Fates, heads of the horses of Hyperion, and one of the horses of Night. Of all these, the Theseus, and the head of the horse of Night, are the most perfect, the former wanting only the hands and feet and part of the nose, while even the surface of the latter is very little injured. But however mutilated, the greatness in style of these magnificent works is clearly manifest, and from the merest fragment valuable instruction in art may be obtained. 2. Fifteen metopes, executed in high relief, representing the battle of the Centaurs and Lapithæ. A metope is the interval between the triglyphs on a Doric frieze—in the Parthenon, there were ninety-two, fourteen on each front, and thirty-two on each flank of the temple—and on every metope, a Centaur engaged in conflict with one of the Lapithæ is represented in a style of the highest excellence in point of spirit and truthfulness. 3. A large portion of the frieze of the outer walls of the cella. This remarkable work represents the solemn procession to the Temple of Minerva during the Panathenaic festival and has never been equalled for elegance of composition and the variety and gracefulness of the figures. It is executed in low relief, in order to adapt it to the light, for placed within the colonnade, it received its light between the columns, and by reflection, from the pavement below. This exquisite frieze occupied,


Theseus.

Metope:
From the Parthenon.

slab after slab, a space of 524 feet in length. The remains of it in the British Museum on slabs and fragments of marble are to the extent of upwards of 249 feet, besides 76 feet in plaster casts.

Portion of Panathenaic Frieze.

Although the Elgin Marbles are now acknowledged to be the most precious collection existing of specimens of Greek art in its purest state, yet it was only after very considerable hesitation that government consented to purchase them, and then the sum awarded was not only far short of anything like a fair value, if indeed a value could be put on such treasures, but Lord Elgin was left largely out of pocket after all his exertions. Again, from petty jealousy, some of the connoisseurs of the day, who had earned a sort of reputation from their collections—of whom Mr Payne Knight may stand for the type—made strong efforts to underrate these great works; while others, like Lord Byron, from feelings apparently generous, but quite mistaken, because not based on fact, heaped obloquy on Lord Elgin, and opposed their acquisition. But it has been clearly proved that Lord Elgin, so far from destroying, has saved these master-pieces from destruction. It was not to be expected but that foreigners would grudge this country such an acquisition, but certainly it is remarkable that such opinions should have been expressed in this country. The view adopted by a foreigner, who has devoted much attention to the subject, M. Viardot, author of *Les Musées d'Europe*, may be accepted as that generally taken abroad; and it is very different from that at one time so pertinaciously maintained by many in this country. M. Viardot remarks: 'It is said that, to justify the appropriation of the Lahore diamond, the English allege that if they have taken it, it was merely to prevent its appropriation by others. They may give the same excuse for their appropriation of the marbles of the Parthenon. No doubt, Lord Elgin has carried them off; and the Greeks of the present day, seeing the old temple of their Acropolis despoiled of all its ornaments, have a good right to curse the spoiler. But when we think of the devastation these works have so often experienced, to the total destruction of the principal statues, and the shameful mutilation of the others, and the risk these last ran of being entirely destroyed in their turn—when we consider that these precious relics of art are conserved in a place of surety, and placed in the centre of artistic Europe, one loses the desire, and almost the right to charge the English with piracy and robbery. For my part, if, in the course of my long devotion to the marbles of Phidias, a regret has come to trouble the ardent pleasure of my admiration, it was, that the robber of these marbles was not a Frenchman, and their resting-place the Museum of Paris.'—*Visconti on the Sculptures in the Collection of the Earl of Elgin* (John Murray, London, 1816), *Library of Entertaining Knowledge—British Museum* (London, Charles Knight).

E'LGINSHIRE, MO'RAYSHIRE, or **MURRAYSHIRE,** a maritime county in the north-east of Scotland, on the Moray Firth. It contains 531 square miles, and is 30 miles long and 20 miles broad, while above a third part is cut off on the south by a detached part of Inverness-shire. In the south are the high and rugged Monadhliadh Mountains of Inverness-shire, dividing the basins of the Spey and Findhorn, and forking in the north to include the basin of the Lossie. The Lossie, 25 miles long, is the only stream entirely included in the county, but the rapid Spey and Findhorn, the latter noted for its fine scenery, skirt its east and west sides respectively. In the south, gneiss predominates with a little granite; and in the north, sandstone with fish and reptilian remains, and small patches of oolitic and wealden strata. West of the Findhorn mouth are the sand-dunes of Culbin, three square miles in extent, some of them rising 118 feet. Great masses of peat and trunks of trees are often cast ashore near the mouth of the Findhorn. The climate is mild and dry, and the county has been called the Devonshire of Scotland, the mountains of Aberdeenshire and Banffshire protecting it from the cold moist winds of the German Ocean. The soil is open, sandy, and gravelly, and very fertile in the north, with some deep loams and clays. In 1857, a fourth of the county was in crop, the chief crops being oats, wheat, and turnips. E. was anciently reckoned the granary of Scotland. Pop. (1861) 42,692, (1851) 38,959, chiefly agriculturists. The chief exports are grain, cattle, salmon, and timber. There are some manufactures of woollens and malt liquors. E. unites with Nairnshire in sending one member to parliament. It contains 20 parishes, and portions of others. In 1851, there were 64 places of worship (25 of Established, and 20 of Free Church); 96 day-schools, with 5726 scholars. The parish schools enjoy the Dick Bequest. The chief towns are Elgin and Forres. The ancient province of Moray included the counties of Elgin and Nairn, and parts of those of Inverness and Banff. Scandinavians early settled in it. About 1160, Malcolm IV. subdued it. The chief antiquities are Elgin Cathedral, Spynie Castle, Duffus Castle, Pluscarden Abbey, Kinloss Abbey, and the Norman parish church of Birnie. Burghead, on the coast, is supposed by many to have been a Roman station, but its ramparts and ditches, now almost destroyed, were probably of more recent origin. It was the last stronghold of the Norsemen in this part of Scotland. E. was overrun in the civil wars of Montrose, 1645, &c.

ELI'AS, St, a lofty mountain which occupies a conspicuous position on the north-west coast of America, in lat. 60° 18′ N., and in long. 140° 30′ W. It rises about 17,860 feet, or almost $3\frac{1}{2}$ miles above the sea, being visible to mariners at a distance of 50 leagues. Physically, it marks pretty nearly the point where the shore, after trending in a north-west direction, turns due west, and politically it divides itself between the territories of Russia and Great Britain.

ELI'JAH (in the Greek form, occurring in the New Testament, Elias), the greatest of the prophets of Israel, was born at Tishbe, in Gilead, on the borders of the desert. He comes upon the scene in the time of Ahab, about 920 B. C. When that monarch, to please his Phœnician wife Jezebel, had introduced, on an extensive scale, the worship of Baal, E. pronounced a curse on the *land.* The prophet had to flee. He took refuge by the brook Cherith, probably one of the torrents that cleave the high table-land of his native region. Here he was miraculously fed by ravens. He then went to Zarephath, a town lying between Tyre and Sidon. Here he lodged with a widow woman, prolonged her oil and meal, and brought back her son to health from the brink of the grave. Subsequently, he made a temporary reconciliation with Ahab, and on Mount Carmel executed dreadful vengeance on the prophets of Baal, slaying 400 with his own hand. Such a deed enraged Jezebel to the utmost. She swore to destroy the prophet, who once more took refuge in flight. He rested not till he reached Beersheba in the far south, on the edge of the desert that leads down to Sinai. The brief allusion in Scripture to his weary wanderings is very touching. At last he comes to Horeb, where he has an interview with Jehovah. The passage in which this is recorded is one of the grandest and most significant in the whole of the Old Testament. He then receives certain instructions from Jehovah, among others that he should select Elisha to be prophet in his room. E.'s next appearance is when Ahab rides forth to take possession of Naboth's vineyard: he denounces the murderous monarch, and utters an awful prophetic curse on him and his wife. After the death of Ahab, he rebukes the idolatries of his son Ahaziah in a solemn and bloody fashion; and after the death of Ahaziah, we find him interfering in the affairs of the king of Judah, who had married a daughter of Ahab, and had begun to 'walk in the ways of the kings of Israel.' He denounced his evil doings, and predicted his death. The closing scene of his life on earth is exquisitely narrated. A chariot of fire and horses of fire appeared after Elisha and he had crossed the Jordan, and 'Elijah went up by a whirlwind into heaven.' His political and religious aims were carried out by his disciple and successor, Elisha.

ELIMINA'TION is a process by which, where we have a number of statements concerning several quantities, we can obtain a separate statement concerning each. Thus, in Algebra, elimination is the operation which consists in getting rid of a quantity or letter which is common, say, to two equations, by forming out of the two a new equation, in such a way as to make the quantity in question disappear. If three unknown quantities, for instance, are to be found from three independent equations, the first step is to form out of the three given equations two new equations, so as to eliminate one of the unknown quantities; from these two equations another of the quantities is eliminated in the same way, giving one equation with one unknown quantity, the value of which is then found. In complicated equations, elimination becomes difficult, and often impossible. Elimination is an important process in other sorts of reasoning besides the mathematical; in this larger acceptation, it means the setting aside of all extraneous considerations—of everything not essential to the result. In astronomical observations, the elimination of errors of observation is often effected by repeating the observations several times in such a way as to cause the errors to be of opposite kinds, then adding the observed values, and taking their average.—The word to 'eliminate,' is often erroneously used in the sense of to 'elicit,' or bring to light.

E'LIS, one of the ancient divisions of the Peloponnesus, bounded N. and N.-E. by Achaia, E. and S. by Arcadia, and W. by the Ionian Sea. It was originally divided into three districts—Cœle or Hollow Elis, Pisatis, and Triphylia. Of these, the first-named was by far the largest and most valuable, comprising as it did the broad and fertile plains watered by the Peneus and the Ladon, and producing excellent crops of corn, cotton, and flax; while the pastures by the river-banks reared cattle and horses of proverbial excellence. This district, from its fertility, was called 'the milk-cow of the Morea.' Pisatis is drained by the Alpheus, and is separated from Cœle Elis by Mount Pholoë, a spur of Erymanthus. The low grounds of this division possess great natural fertility. Most of the surface of Triphylia is hilly, being occupied with offshoots from the great Arcadian ranges. It is separated from Pisatis by the Alpheus, on whose banks were the grove and temple of Olympic Jove, and the plain in which the great Olympic games were celebrated. Though E. had few facilities for preventing invasion, it yet suffered less from war than any other of the Greek states—an advantage chiefly due to the sacred character of the country, as the seat of the greatest of the national festivals. Their prerogative of holding the Olympic games gave the Eleans a prestige which they continued to enjoy in greater or less degree till the games themselves were suppressed by the Emperor Theodosius in 394 A. D.—ELIS, now *Kaloscopi,* the capital of the foregoing country, stood on the Peneus, and was long famous as one of the most splendid and populous cities of Greece. It was at one time strongly fortified, and contained many magnificent buildings, conspicuous among which was the Gymnasium, in which it was necessary that all athletes intending to take part in the Olympic games should go through a month's training before they were allowed to compete. See Leake's *Morea,* and Curtius's *Peloponnesus.*

ELI'SHA, a prophet of Israel, the successor of Elijah, who found him at the plough, and consecrated him to the sacred office by throwing his mantle over his shoulders. He exercised his functions for a period of 55 years. When Elijah was carried up into heaven, E. returned to Jericho, where he dwelt for some time. He then proceeded to Bethel, where the perplexing miracle occurred of the destruction of the 42 children by the two she-bears. After this period, he seems, besides performing an extraordinary number of miracles, to have taken an active part in the religious politics of his country, but he exhibited nothing of the fiery and sanguinary zeal of his master. Mild, tolerant, conciliatory, we hardly ever, if at all, find him rebuking the Baal-worship that was still prevalent in Israel. Many of the incidents in his history recall the creations of eastern fancy, such, for example, as those of the horses and chariots of fire round about E. on the hillside, of the smiting of the Syrian host with blindness, so that the prophet led them all unconsciously into Samaria, captive, &c. With Elijah, it has been said (see Smith's *Dictionary of the Bible:* Art. 'Elisha'), the miracles are 'introduced as means towards great ends, and are kept in the most complete subordination thereto. But with E., as he is pictured in the Hebrew narrative, the case is completely reversed; with him, the miracles are everything, the prophet's work nothing. The man who was for years the intimate companion of Elijah, on whom Elijah's mantle descended, and who was gifted with a double portion of his spirit, appears in the Old Testament chiefly as a worker of prodigies, a predicter of future events, a revealer of secrets, and things happening out of sight or at a distance.' The difficulties that thus beset the literal acceptance of the narrative of E.'s miracles have been felt by most modern commentators, and to evade these difficulties various methods, more or less satisfactory, have been employed. For several years, E. was the chief theocratical counsellor of Jehoram. Under the reign of Jehu and his successors, he gradually withdrew from public affairs, and died in Samaria in the reign of Jehoash, grandson of Jehu (about 840 B.C.). It has been customary to draw a parallel between E. and Christ; and his mildness and gentleness—always excepting the story of the destruction of the children at Bethel, which has perplexed all humane readers of Scripture—seem to justify this. E. is canonised in the Greek Church; his day is the 14th of June.

ELI'XIR (Lat. *elixare*, to extract by boiling), a term in pharmacy, which has come down from the days of alchemy, and is applied to various preparations, consisting mostly of solutions of aromatic and bitter vegetable substances in spirits of wine. The term tincture is now more common. ELIXIR OF VITRIOL, or Aromatic Sulphuric Acid, is prepared from 1½ fluid ounces of sulphuric acid (oil of vitriol), 10 fluid ounces of rectified spirit, ½ oz. cinnamon in powder, 1 oz. ginger in powder. The acid is gradually added to the spirit, and the mixture being placed in a closed vessel, is allowed to digest at a gentle heat for three days; the cinnamon and ginger are then added, and after being allowed to stand about six days, the whole is strained through cloth. The elixir of vitriol is useful for quenching thirst, sharpening the appetite, checking profuse perspiration, and often reducing the action of the pulse. The dose may range from 10 to 40 minims, and is administered in a wine-glassful of water, or some mild liquid, as infusion or conserve of roses.—ELIXIR VITÆ OF MATHIOLUS is composed of alcohol, and upwards of twenty aromatic and stimulating substances, and was at one time administered to patients suffering from epilepsy.

ELI'ZABETGRAD, a town of South Russia, is situated in the midst of a delightful plain, on the banks of the Ingul, in lat. 48° 27' N., long. 32° 15' E., about 130 miles north from Kherson. It consists of a town proper and four suburbs, is well built, its streets straight, wide, and adorned with avenues of trees. E. has a large arsenal within the walls, and is protected by six bastions. A considerable trade is carried on here in the produce of the surrounding districts; and an annual fair is held, which is attended by many thousands of dealers; commerce is also carried on with Poland and Moldavia. In the immediate neighbourhood of the town there are upwards of 30 wind-mills. Great numbers of cavalry are always present in E., as it is the head-quarters of the military colonies east of the river Bug. Pop. in 1855, 13,494.

ELI'ZABETH, Queen of England, was the daughter of Henry VIII. and the unfortunate Anne Boleyn, and was born 7th September 1533. While she was yet in her third year, her mother was beheaded. After her mother's execution, she was sent to the country, where, in comparative poverty and seclusion, under the care of ladies who leaned to the 'new learning,' and sometimes, though seldom, with the companionship of her brother Edward, or her sister Mary, the greater part of her early youth was spent. When Catharine Parr became queen, E., who was a favourite with her, was more seen at court; but from some unknown cause, she incurred her father's displeasure, and was again sent to the country. Her father died when she was twelve years old. During the reign of her brother Edward, her life passed quietly and peacefully. She was then remarkable for a great demureness and sobriety of manner, discoursing with her elders with all the gravity of advanced years. Edward used to speak of her as his 'sweet sister Temperance.' During her sister's reign, this demureness was exaggerated into prudery, and the vanity which, in after-years, with ampler means at its command, displayed itself in the utmost profusion of personal decoration, then sought for distinction by excess of plainness. Her Protestantism, and the way in which court was paid to her by the Protestant nobility, caused uneasiness to Mary and her council. On her sister's command, she conformed to papacy, but the insincerity of the conformity imposed upon no one. Upon the pretext of having been concerned in Wyatt's rebellion, she was sent in 1554 to the Tower. She entered it with all the gloomy forebodings which the fate of so many royal ladies who had been recently within its walls, could suggest. In daily fear for her life, many months passed. Indeed, the warrant for her execution was at one time prepared; and it is unquestionable that the stern bigotry of Mary and her councillors, Gardiner and Bonner, would have sacrificed E., but for the fear of popular commotion. The people, however, regarded E. with great favour, and many already looked forward to the time when the death of Mary should free the court from foreign influence, and give room for a milder government. Thus the life of E. was saved, but for some time longer she was kept a prisoner at Woodstock. During the remainder of Mary's reign, E., though occasionally at court, resided chiefly at her residence of Hatfield House, in Hertfordshire, where she occupied herself with feminine amusements, and the study of classical literature, under the learned Roger Ascham.

When Mary died (17th November 1558), E. was twenty-five years of age. Her accession was welcomed alike by Catholic and Protestant. The former were, outwardly at least, the majority in Mary's reign; but among them there were few who really cared for the peculiar doctrines of the Roman Church, and there were many who were weary of priestly interference, foreign dictation, and cruel persecution. Like E. herself, there were many who had conformed merely to save themselves from trouble. They had obeyed the Six Articles in Henry's time; had agreed to the Protestant settlement of Edward; had turned with Queen Mary, and were now ready to turn again with Queen Elizabeth. The Protestants, of course, who had never believed the sincerity of E.'s conformity, welcomed her to the throne. E. then began, amidst dangers and difficulties, a reign which, contrary to the expectation of all, was of unexampled length and prosperity. It would be wrong not to attribute to her influence some effect in producing the great changes which, during the next forty-four years, took place in England; but so far as these changes were not produced in the natural course of the development of the nation's powers, and so far as they bear the mark of an individual mind, they bear much more the impress of the bold yet cautious judgment and clear intellect of the great minister, Cecil, than of the sovereign's will. It is to the highest praise of E. that her first act on succeeding was to consult with such a man, and that to the very last she could bend her capricious temper to his control.

How the government influence was to be directed, was not long in being shewn. Till parliament should meet, E. issued a proclamation that the English language should be used in the greater part of the church service, and that the Host should not be elevated by the priest during mass. This sufficiently indicated into what hands power had passed, and was enough to throw the mass of the indifferent to the side of the Protestants, and to cause a Protestant majority to be returned to E.'s first parliament. The acts of this parliament must be ever memorable in our history. It was then that England took its position as a Protestant power. The Book of Common Prayer, retaining, doubtless, some mixture of medieval thought, but still vivid with new energy, was appointed to be used in all churches; the Thirty-nine Articles were settled as the national faith; the queen was declared to be head of the church. Thus all allegiance to Rome was thrown off. This revolution was soon accomplished, and with little turmoil. The bishops, with one exception, refused to conform; but as a sign of the times, marking how thoroughly the priesthood must have become demoralised before their power was lost, it is noteworthy that of the 9000 clergymen who held livings in England, there were fewer than 200 who resigned, rather than obey the new order of things.

The policy of E.'s ministers was one of peace and economy. They found the nation at war with France and Scotland, and one of their first acts was to secure peace upon favourable terms. Ever afterwards, they followed the same path. No war was undertaken in her reign for the sake of territorial conquest. To strengthen her own throne, E. secretly succoured the Protestants in Scotland, in France, and in the Low Countries; but she had few open wars. To be at peace with a government, nay, apparently to be upon the most amicable of terms with it (as E. was with the French court, while she sent assistance to the Huguenots at Rochelle), and at the same time to aid its rebellious subjects, was in those days thought only part of the politic dissimulation without which, it was believed, no nation could be safely ruled. To maintain the security of her own throne, and to prevent foreign interference in English matters, was the mainspring of E.'s foreign policy; and she lost no opportunity of weakening and finding occupation abroad for any foreign power that unduly threatened her authority.

The one great blunder of England's policy was the treatment of Mary Queen of Scots. Had E. pursued a straightforward course, when her rival was thrown into her hands, much evil might have been spared. Some of the English ministers were prepared to take effectual measures to remove a life which might be turned into so dangerous a tool in the hands of Catholics. E. shrank from that course, but had not the courage and generosity to set Queen Mary at liberty. Had this course been taken, Mary would have gone to France or Spain, would have made a foreign marriage, and as a foreigner would have lost the only sources of her real power—the sympathies of the Scotch and English Catholics. As it was, E. retained her a prisoner, and thus for years gave cause to conspiracy after conspiracy among the English Catholics. For a rebellion incited to set Mary free, the richest and most popular of the English nobility, Norfolk, was executed. The discovery of every new plot led to demands, on the part of parliament, for the execution of Mary. The plots then took a graver aspect. The assassination of E., and the placing of Mary on her throne, became the object. On the discovery of Babington's conspiracy for this purpose, the popular cry was irresistible, and was joined in by Cecil and Walsingham, and others of E.'s ministers, who had sinned too deeply against Mary to run the risk of her succession to the throne. With reluctance and hesitation, the sincerity of which need not be questioned, E. consented; and Mary, after long years of confinement, was condemned and executed.

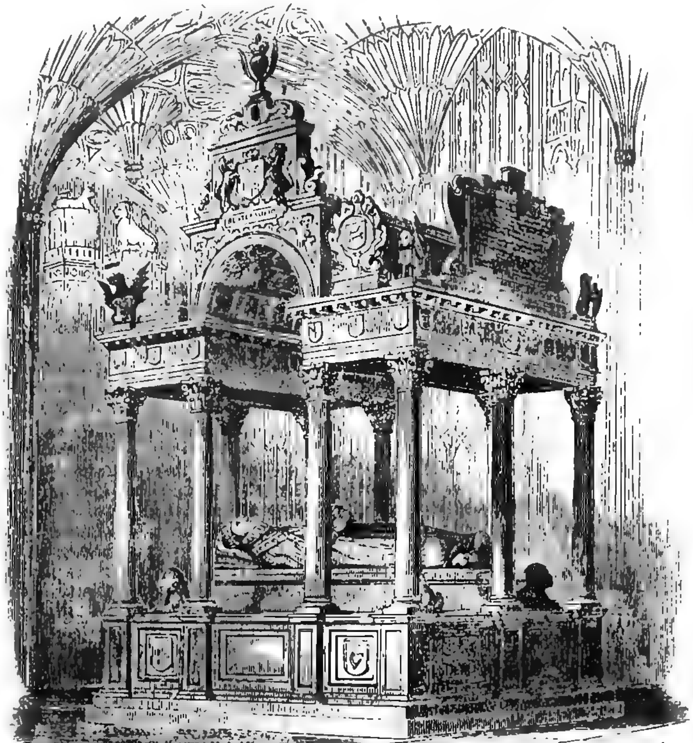
Fac-simile of Queen Elizabeth's Signature.

This led to new evils. The participation of the Catholic party in the plots was retaliated by persecution. Many suffered under an act passed in 1585, making it treason for a Catholic priest to be in England, and felony to harbour one. These cruel measures were the ultimate means of bringing upon England the most menacing foreign attack which she had suffered. Philip of Spain had long meditated vengeance against England. The greatest state in Europe, enriched by splendid acquisitions in the New World, could ill brook that a power of the second rank should incite rebellion among her subjects in the Netherlands, should aid the Protestants in their desperate struggle against Alva, and allow its ships (little better than pirates, it must be confessed) to enter the Spanish harbours, and cut out the rich laden galloons. These were the real reasons: to restore the Catholic faith, and to revenge the death of a Catholic queen, furnished ostensible reasons. Years had been spent in preparation. In 1588, the 'Invincible Armada' sailed from the Tagus, manned by 8000 sailors, and carrying 20,000 soldiers. To aid these, a land-army of 100,000 men was to be transported from the Netherlands under the Duke of Parma. The news roused all England, and every man who could carry arms—Protestant and Catholic from 18 years of age to 60—was enrolled in the forces. The old queen herself rode at Tilbury, energetically encouraging the army. A fleet of 200 vessels and 15,000 seamen gathered itself on the southern coasts, and waited the attack. Superior skill and courage gained the victory for the English; and what these had begun, the force of the elements completed. The splendid Armada was broken and destroyed before it could join the land-army, not a soldier of which ever left foreign ground; while not a seaman of the fleet, save those whom shipwrecks sent, ever set foot on English ground.

E. died on 24th March 1603, having lived nearly 70, and reigned nearly 45 years. If the life of her rival, Mary of Scotland, read somewhat like a tragedy, the private life of E. might afford abundant materials for comedy. Always parading her wish to live an unmarried life, E. coquetted with suitor after suitor till long after that period of life when such proposals verge upon the ridiculous. Of her father's schemes to marry her to the Scotch Earl of Arran or to Philip the son of Charles V.—afterwards husband of Mary—it is unnecessary to speak, for E. had personally little to say in regard to them. But she was scarcely more than a child when her flirtations with the handsome Lord Admiral Seymour—the brother of the Protector Somerset—had passed the bounds of decorum. In Mary's reign, E. was flattered with the attentions of her kinsman, the Earl of Courtenay, and she declined the hand of Philibert of Savoy, pressed on her by her sister's council. When queen, with some hesitation she refused the offer of Philip II., who was desirous of perpetuating his influence over England, and she began that connection with Leicester, which so seriously compromised her character. It is certain that she loaded him with honours as soon as she had them to bestow; allowed him to become a suitor for her hand within a few days after the sudden death of his wife, Amy Robsart, attributed by all England to his agency; and allowed him to remain a suitor long after his open profligacy had disgusted the nation, and had even opened her own eyes to his worthlessness. If we credit the scandal of the times, the intimacy was of the most discreditable kind. If we credit those sources of information, recently turned to more profit by Mr Froude than by any of his predecessors, which are found in the dispatches of the Bishop of Aquila, ambassador of Philip II. in London, preserved in the archives of Simancas, not only was the moral character of E. sullied with the darkest crimes, but even the quality for which she has ever been most honoured, her English patriotism, was mere affectation. These dispatches represent her as accessory—at least, after the fact—to the murder of Amy Robsart, and as offering to Spain to become a Catholic, and to restore the Spanish ascendency in England, if Philip would support her on the throne as the wife of Leicester; and they represent her as being restrained from giving way to the fatal consequences of her wild passion only by Cecil's control. That there is some basis of truth in this revelation, it is scarcely possible to deny; but the hatred with which Philip regarded E., after her refusal to marry him, has undoubtedly led the courtly bishop to gross exaggerations. It is undeniable, however, that had E. followed her own inclinations, she would have married Leicester. Her ministers, wisely for the nation, prevented this, but E. never seriously entertained another proposal. Cecil could prevent her marrying whom he would not, but he could not force her to marry whom he would. Among less distinguished suitors, the Archduke Charles of Vienna, and Prince Eric of Sweden, pressed their suit in vain. Petitions from parliament to the queen to marry, only excited her maidenly wrath, and produced dignified replies that she would attend to the matter when the time came. Years passed on, and she remained a spinster. Catharine of Medici, queen-mother of France, intrigued to marry her to one of her sons, Henry of Anjou (afterwards Henry III.), or the Duke of Alençon, afterwards Duke of Anjou. When the foreign envoys pressed the suit of the latter, E. was 38 years of age, and her suitor 19; but they ingeniously flattered her that she and he looked of the same age, for she, by her good preservation, looked nine years younger than she was; while the duke, by his wisdom, gravity, and mature intellect, looked nine years older. This flattery, with more plausible attractions, was without effect.

E.'s position gave too much scope for the development of the unamiable and ridiculous features of her character. The personal vanity displayed in her extravagant dress, her conversation, her 'high and disposed' dancing, excites a smile, not lessened when we read of the irritable mistress boxing the ears of her councillors, cuffing her attendants, indulging in expressive masculine oaths, and amusing herself with rough masculine sports. The assertion that she was of a cruel disposition is false. That she could do cruel things when her vanity was concerned is sufficiently attested by her ordering the right hand of a barrister, named Stubbes, to be struck off for writing a remonstrance against her marriage with the Duke of Alençon, which she thought unduly reflected on herself; but in her reign, the reckless waste of human life which marked the reigns of her predecessors was unknown. She was not, however, of fine feelings. Her brother could compliment her on the calm mind and elegant sentences with which she replied to the communication of the death of her father. On the news of her sister's death, she burst out with rhapsodical quotations from the Psalms; and when she heard of the execution of her lover Seymour, she turned away the subject with something like a jest. By her attendants, she was more feared than loved. The one quality which never failed her, was personal courage; and when she chose, her demeanour was stately and royal. Religion was with her, as with a great proportion of the nation at that time, a matter more of policy and convenience than of feeling or principle. She preferred Protestantism, from early associations, because it gave her the headship of the church, freed her from foreign interference, and was more acceptable to her ministers and to the nation. But she had conformed in Mary's time to Catholicism with little difficulty; and, had there been necessity for it, she would rather have reigned a Catholic than not have reigned at all. To the last, she retained in her private chapel much of the ritualism of the Roman Church; and while refusing her Catholic subjects the exercise of their religion, she entertained the addresses of Catholic suitors. How thoroughly incapable she was of appreciating a matter of religious principle may be gathered from the fact, that she looked upon the great Puritan movement, destined soon afterwards to play so important a part in the nation's development, as some frivolous controversy about the shape of clerical vestments. Of toleration, then well enough understood by Bacon and the more advanced spirits of the age, she had no conception.

What makes the name of E. so famous, was the splendour of her times. In her long reign, the true greatness of England began. Freed from the possession of those French provinces which rather harassed than enriched—with little domestic commotion—with no great foreign wars—with an almost complete immunity from religious persecution, the nation turned to the arts of peace. An unequalled literature arose. The age that produced Spenser, Shakspeare, and Bacon, could not be other than famous. Under Frobisher and Drake, maritime adventure began, and the foundations of our naval force were laid. Commerce, from being a small matter in the hands of a few foreign merchants, developed itself largely. The Exchange of London was opened in E.'s time; and in the charter which she granted to that Company of Merchant Adventurers, which afterwards took the name of the East India Company, may be seen one of the small beginnings of our vast colonial empire. The social condition of the people also greatly improved in her reign. The crowds of vagabonds which the monastic institutions had fostered, and who had pillaged the country in all ways on the secularisation of the monastic property, died out, or were absorbed in industrious employments. The last traces of bondage disappeared. Simultaneously with the growth of greater comfort and intelligence in the people, parliament began to assert, with greater vigour, its constitutional rights. The right of the Commons to free speech, and to initiate all money-bills, was steadily asserted; and the right of the Crown to grant monopolies, or to issue proclamations having the force of law, vigorously assailed. In the later years of her reign, the attempts of E. to gain arbitrary power, and her caprices, had forfeited the popularity which she so anxiously cultivated. But after her death, her fame revived; and during the time of the Stuarts, amid the jealousy of the Scotch, the troubles of the civil wars, and the hatred of a Catholic sovereign, the nation looked back with fond regard to the long reign of the 'Good Queen Bess,' when peace had prevailed, and the government had been thoroughly English.



Queen Elizabeth's Tomb:
In the North Aisle of Henry VII.'s Chapel, Westminster Abbey.

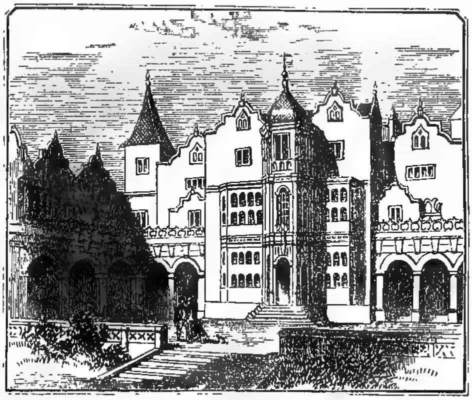
ELIZABETH, St, daughter of Andreas II., king of Hungary, was born at Presburg in 1207. At the age of four, she was affianced to the Landgraf of Thuringia, Louis IV., called the Pious, and brought to his court to be educated under the eyes of the parents of her future husband. She early displayed what may be called a passion for the severities of the Christian life, as it was conceived in those days. She despised pomp, avarice, ambition; cultivated humility, and exhibited the most self-denying benevolence. Her conduct, even as a girl, astonished the Thuringian court; but such was the grace and sweetness of her disposition, and the excellence of her beauty, that Louis—though her affections seemed to be given wholly to God—still wished to marry her. They were united when E. was only 14. Louis himself, far from blaming the devout girl whom he had made his wife for her long prayers and ceaseless almsgiving, was himself partially attracted to a similar mode of life. A boy and two girls were the fruit of their union; but the happiness of E., in so far as it depended on anything earthly, was shattered by the death of her husband in 1227, when absent on the crusade headed by Barbarossa. Her confessor, Conrad of Marburg, a narrow fanatical monk (to whose miserable teaching E. mainly owed her perverted idea of life and duty), had trained her to stifle the emotions of her nature as sinful, and the poor widow hardly dared to bewail her loss. Great misfortunes soon befell her. She was deprived of her regency by the brother of her deceased husband, and driven out of her dominions on the plea that she wasted the treasures of the state by her charities. The inhabitants of Marburg, whose miseries she had frequently relieved, refused her an asylum, for fear of the new regent. At last she found refuge in a church, where her first duty was to thank God that he had judged her worthy to suffer. Subsequently, after other severe privations, such as being forced to take up her abode in the stable of a hostelry, she was received into the monastery of Kitzingen by the abbess, who was her aunt. When the warriors who had attended her husband in the crusade returned from the East, she gathered them round her, and recounted her sufferings. Steps were taken to restore to the unfortunate princess her sovereign rights. She declined the regency, however, and would only accept the revenues which accrued to her as landgravine. The remainder of her days were devoted to incessant devotions, almsgivings, mortifications, &c. There is something mournfully sublime in her unnatural self-sacrifice. We shudder even in our sympathy when we read of this beautiful tender-hearted creature washing the head and the feet of the scrofulous and the leprous. Murillo has a painting (now in the Museum at Madrid) of this act of evangelical devotion. The solemn tragedy of her brief life assumed towards its close a ghastly intensity through the conduct of her confessor, Conrad, who, under pretence of spiritual chastisement, used to strike and maltreat her with brutal severity. The alleged cause of this was Conrad's aversion to her 'squandering' her money among the poor. Perhaps he thought it should have gone to *him*. At last her health gave way; and on the 19th November 1231, at the age of 24, E. died, the victim partly of ill-usage and partly of a mistaken theory of religious life, but as gentle and saintly a soul as figures in the history of the middle ages. She was canonised four years after her death. See Montalembert's *Histoire de Sainte Elisabeth de Hongrie* (Paris, 1836). The Rev. Charles Kingsley's dramatic poem, entitled *The Saint's Tragedy* (London, 1848), is founded on the story of E.'s life.

ELIZABETH PETRO'VNA, Empress of Russia, daughter of Peter the Great and Catharine I., was born in the year 1709. On the death of Peter II. in 1730, she allowed Anna, Duchess of Courland, to ascend the throne, she herself being apparently indifferent to anything but the indulgence of her passions. Anna died in 1740, and Ivan, the son of her niece (also called Anna), an infant of two months, was declared emperor, and his mother regent during his minority. Shortly after this, a plot was formed to place E. upon the throne; the two principal agents in it were Lestocq, a surgeon, and the Marquis de la Chetardie, the French ambassador. The officers of the army were soon won over; and on the night of the 5th December 1741, the regent and her husband were taken into custody, and the child Ivan conveyed to Schlüsselburg. The leading adherents of Anna were condemned to death, but pardoned on the scaffold, and exiled to Siberia. By eight o'clock in the morning, the revolution was completed, and in the afternoon all the troops did homage to the new empress. La Chetardie was handsomely rewarded; and Lestocq was created first physician to the empress, President of the College of Medicine, and privy councillor. E., however, did not possess the qualities requisite in a ruler. She wanted energy, knowledge, and love of business, and allowed herself to be guided by favourites. In order to strengthen her position, E. took pains to win over her nephew, the young prince Peter, the son of her sister, the Duchess of Holstein-Gottorp. She summoned him to Petersburg in the year 1742, and proclaimed him her successor. E. took part in the Austrian War of Succession, and in spite of the opposition of France, despatched an army of 37,000 men to the assistance of Maria Theresa, and thereby hastened the conclusion of the peace of Aix-la-Chapelle in 1748. E. shewed herself less placable towards Frederick II., against whom she cherished a personal enmity, excited by some severe expressions he had employed respecting her. At the commencement of the Seven Years' War, she allied herself with Austria and France, and marched her troops into the Prussian states. Her troops gained the victory in the battles of Grossjägerndorf and Kunersdorf, and took possession of Berlin, but without any decisive result. E. died before the expiration of the war, 5th January 1762. She founded the university of Moscow and the Academy of Art at St Petersburg. Though no person was put to death during her reign, the most shocking punishments were inflicted, and thousands were exiled to Siberia and Kamtchatka. E. had several illegitimate children. Profligacy, espionage, and persecution reigned in her court, the administration of justice was restrained, and the finances neglected; but E. was nevertheless extremely strict in the observance of the public ordinances of religion.

ELIZABETH STUART, Queen of Bohemia, remarkable not only as a heroine, but as forming the connecting link between the ancient royal families of England and Scotland and the present reigning dynasty, was born in the palace of Falkland (q. v.) on the 19th of August 1596. On the accession of her father, James VI. of Scotland, to the crown which fell to him by the demise of Queen Elizabeth, in 1603, she accompanied the family to England, where she was educated. On the 14th of February 1613, E. was married to Frederick, Elector-Palatine, whom she soon after accompanied to his residence, the castle of Heidelberg (q. v.); see also PALATINATE. When the Protestant princes of Germany sought for a fitting person to fill the throne of Bohemia, they made choice of Frederick, who accepted the perilous honour, partly, perhaps, from the ambition of his wife, who is alleged to have longed for the title of queen. The Palatine removed with E. and three children to Prague, which they entered, October 21, 1619. Frederick and E. occupied the throne of Bohemia only about a year. By the forces of the Catholic League, the army of Frederick was routed at the battle of Prague, November 8, 1620, and the royal family fled into exile, for already the Palatinate was laid waste. With her husband and children, and a few faithful attendants, E. took up her residence at the Hague, and ever afterwards the family lived in a state of dependence. E. was the mother of thirteen children, the eldest of whom was accidentally drowned in Holland, and three others died young. The next were Charles-Louis and Rupert, and, following in order, were Elizabeth, Maurice, Edward, Philip, Louisa, Henrietta-Maria, and Sophia. From this numerous offspring, E. derived little comfort in her misfortunes. Charles-Louis was a selfish, calculating person, with low, disreputable habits. Rupert (q. v.), the 'mad cavalier,' and his brother, Maurice, fought in England during the civil war, and, after the loss of the royalist cause at the battle of Naseby, they betook themselves to the sea, and for some time were little better than pirates. Edward, in 1645, abjured Protestantism, and was admitted into the Roman Catholic Church. Philip committed an assassination at the Hague, fled from justice, became a soldier of fortune in France, and was slain in the civil wars. Elizabeth accepted the office of superior of the Lutheran abbey of Hervorden, Henrietta-Maria was espoused by Ragotzi, Prince of Transylvania, but died shortly after her marriage. Louisa fled to France, and died as abbess of Maubisson. Previous to these events, E. became a widow by the death of Frederick, February 17, 1629, when his right to the Palatinate devolved on Charles-Louis, who, by the treaty of Westphalia, was restored to the family inheritance, October 24, 1648. This favourable turn of affairs did not mend the fortunes of E., who was scandalously neglected by her son, the young Elector-Palatine; and all he would do for the family was to give a shelter to his youngest sister Sophia, until she was married to Ernest-Augustus, a scion of the House of Brunswick, who ultimately succeeded to the electorate of Hanover.

Deprived, in one way or other, of all her children, the Queen of Bohemia—by which title she continued to be known—resolved to quit Holland. Relieved of her debts by the sale of jewels, and by aid of a pecuniary subsidy from the British parliament, she embraced an invitation from her nephew, Charles II., to come to England. She arrived May 17, 1661. From this time she was in a great measure indebted to the hospitality of Lord Craven, in a mansion which he had purchased from Sir Robert Drury, in Drury Lane, London. Charles II. paid her little attention; but at her death, which occurred February 13, 1662, he caused her remains to be interred in Westminster Abbey. Charles-Louis, her son, died in 1680, leaving a son, who died without issue, and the Palatinate then went to a distant branch of the family; he left also a daughter, Charlotte-Elizabeth, who, in 1671, had married Philip, Duke of Orleans, only brother of Louis XIV. In 1674, she gave birth to a prince, who became the noted Regent of France during the minority of Louis XV. She died at St Cloud in 1722. The late Louis-Philippe, king of the French, was her lineal descendant. When, in 1708, the question of succession to the crown of Great Britain was debated, it was found that all the descendants of James I. were either dead or were Roman Catholics, except Sophia, Electress of Hanover, and her family. By act of parliament, that year, the crown was accordingly secured to her and her descendants, 'being Protestants;' and in virtue of this act of settlement, on the death of Queen Anne, Sophia would have ascended the throne, but she predeceased the queen three months, and her son became sovereign of these realms as George I., August 12, 1714. In this extraordinary and unforeseen manner did a grandson of the unfortunate queen of Bohemia become king of England, and originate the dynasty of the reigning monarch. The *Memoirs of Elizabeth Stuart, Queen of Bohemia*, by Miss Benger, 2 vols., may be perused as an accurate and pleasing piece of biography.

ELIZABE'THAN ARCHITECTURE, a term applied to the mixed style which sprang up on the decline of Gothic architecture. By some it is called the Tudor style, but that name belongs more correctly to the Perpendicular, or latest kind of Gothic. The Elizabethan is chiefly exemplified by mansions erected for the nobility in the reigns of Elizabeth and James I., and originated in the first attempt to revive classic architecture, influenced, no doubt, by Holbein, who was patronised by Henry VIII., and furnished several designs in this manner. John of Padua succeeded him, and built in the mixed style a palace for the Protector Somerset (for which purpose the cloisters of St Paul's were taken down), and the mansion of Longleat for his secretary, Sir John Thynne. The vast dimensions of the apartments, the extreme length of the galleries, and enormous square windows, are the leading characteristics of this manner of building. The ornaments both within and without were cumbrous; nothing could exceed the heaviness of the cornices and ceilings wrought into compartments; in short, the architecture was just in keeping with the dress of the period, rich and gorgeous, rather than elegant, graceful, and comfortable. The following examples of mansions of the 17th c. may be still seen near London: Holland House, Campden House; and the following in Kent: Sir T. Willow's at Charlton, the Marquis of Salisbury's at Hatfield, and Knowle, the property of the Duke of Dorset. The most eminent architects of those times were John Thorpe, Gerard Christmas, Rodolph Symonds, and Thomas Holt.



Holland House.

ELIZABETO'POL, a town of Russian Transcaucasia, is situated in lat. 40° 42′ N., long. 46° 20′ E. The town consists of three parts, one of which is fortified with a bastioned wall. Its principal buildings are its churches and mosques, of which there are many. A peculiarity of this town is its numerous fruit-gardens or vineyards. Horticulture, the rearing of silk-worms, bees, and cattle, with agriculture and mining, are the chief occupations of the inhabitants. Pop. (1855) 12,966, principally Tartars and Armenians.

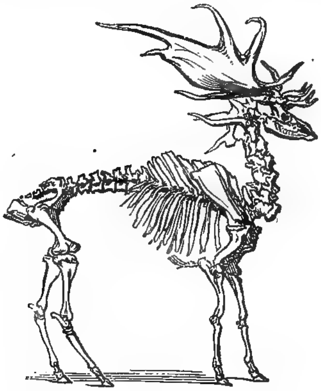
ELK, MOOSE, or MOOSE DEER (*Alces Malchis*, or *Cervus alces*), the largest existing species of the *Cervidæ*, or deer family, is a native of the northern parts of Europe, Asia, and America. When full grown, it is about six feet in height at the shoulders, and sometimes weighs 1200 pounds. The body is round, compact, and short; the neck is short and thick, unlike that of deer in general, but thus adapted for sustaining the great weight of the head and horns. The head is very large, narrow, about two feet long. The horns in males of the second year are unbranched, not flattened, and about a foot long; as the animal becomes older, they begin to display a blade, with more numerous snags, and in mature elks the blade becomes very broad, the snags sometimes fourteen on each horn; a single antler has been known to weigh about sixty pounds. The horns have no basal snag projecting forwards. The ears are long, and have been compared to those of the ass. The eyes are small. The limbs are long, and very graceful. The tail is only about four inches long. The body is covered with coarse angular hair, which breaks when it is bent. On the neck and withers there is a heavy mane, and the throat is covered with long hair. A large goitre-like swelling under the throat of the younger elks has a very curious appearance. The hoofs of the E., like those of the reindeer and of the buffalo, are so constructed as to part widely, and to afford a better footing on soft marshy ground or on snow: they make a clattering when it runs. In running, it carries its muzzle forward, with the horns thrown back upon the neck, so that they may not be caught by branches. Its shoulders being higher than the croup, its common gait is a shambling trot; but it can also gallop with great rapidity. The colour of the elk is brownish black, darker in winter than in summer; the limbs, the sides of the head, and the mane are of a lighter colour than the body. Elks are sometimes seen in small herds, but often singly; they are now very rare in Europe, and are no longer found in parts of North America in which they were once common. They formerly extended as far south as the Ohio. They are sometimes seen even on the shores of the Arctic Ocean. They delight in marshy districts and in forests. When compelled to eat grass, they must get down on their knees to reach it: their proper food consists of the branches and foliage of shrubs and trees. They are very timid and inoffensive, except during the rutting season. A single stroke of an elk's fore-foot is sufficient to kill the strongest dog. It is also an extremely wary animal, and is with the greatest difficulty approached by the hunter. Its sense of smell is very acute, and the slightest sound excites its alarm. It is, however, much sought after in North America. In Sweden, its destruction is prohibited; and in Norway is placed under legal restrictions. The flesh of the elk is esteemed a good kind of venison; the fat is remarkably soft; the nose and the tongue are reckoned delicacies. The skin is used for a variety of purposes.

Elk (*Cervus alces*).

The elk is easily domesticated, and was at one time employed in Sweden for conveying couriers, being capable of travelling more than 200 miles in a day when attached to a sledge.

The elk of Ceylon is a deer of the group to which the name *Rusa* has been given.

ELK, Irish (*Megaceros Hibernicus*), a large deer found in the Pleistocene strata. There is a double error in its popular name, for it is a true deer, between the fallow and rein deer, and though abundant in Ireland, it is not peculiar to that country, being found also in England, Scotland, and on the continent of Europe. In Ireland, it occurs in the shell marl underlying the extensive turbaries. In England, lacustrine deposits and brick-clay contain its remains, and, associated with the mammoth and rhinoceros, they are found also in ossiferous caves.



Fossil Elk.

The most striking feature in this animal was its enormous antlers. A straight line drawn between their extreme tips in one specimen measured ten feet ten inches. The form of the antler differs from that of any living species of deer. The beam enlarges and flattens into a palm; a brow snag exists as in the fallow-deer, but in adult specimens, this bifurcates and expands somewhat as in the reindeer —a peculiarity never observed in the fallow-deer group. The antler is also furnished with a back snag. Some idea of the enormous size and weight of the antlers may be formed from the fact that, in a specimen where the head weighed 5¼ pounds, their weight was 81 pounds. To sustain this, the vertebræ of the neck and the limbs are very much larger and stronger than in any other deer. A fine and almost perfect specimen of this animal, from the Isle of Man, exists in the Edinburgh Museum.

EL-KHA'RGEH, capital of the Great Oasis, Upper Egypt, is situated in lat. 25° 28′ N., long. 30° 40′ E. In the vicinity of the town are numerous ruins, among which are those of a temple; there is also a remarkable necropolis. Pop. 6000.

ELL (allied to *el*bow, Ger. *ellen*bogen, Lat. *ulna*, the fore-arm or arm in general) is a measure of length now little used. It was originally taken in some vague way from the arm, and hence has been used to denote very different lengths. The Latin ulna appears to have denoted sometimes the measure from the elbow to the tips of the fingers, sometimes that between the outstretched hands. The English ell, as a measure of cloth, is equal to five quarters of a Yard (q. v.).

E'LLENBOROUGH, Earl of. Edward Law, first Earl of E., son of the first baron (many years Chief-justice of the King's Bench), was born 1790; educated at Eton and at St John's College, Cambridge, where he graduated M.A., 1809; succeeded his father in the barony in 1818; was Lord Privy Seal in the Duke of Wellington's administration, 1828—1829; President of the Board of Control during the short-lived Peel administration of 1834—1835; and appointed, on the return of Sir Robert Peel in September 1841, to the same office, which he relinquished a month afterwards for the post of Governor-general of India. He received the thanks of parliament in 1843 for his 'ability and judgment' in supporting the military operations in Afghanistan. In many other respects, his Indian administration was open to censure. He was charged with reserving his favour for the military, and inflicting undeserved slights upon the civil servants of the Company. He made showy progresses; addressed proclamations to the rulers and natives of India which appeared to sanction idolatry; and, finally, in his proclamation concerning the sandal-wood gates of the temple of Juggernaut, when brought back from Ghuznee, he reached the climax of a series of extravagances, which induced the directors of the East India Company to exercise a power only used in extreme cases, and to recall him. The ministry, however, stood by him, and he was created by the crown an earl and a viscount; he also received the distinction of G.C.B. In 1846, Sir R. Peel made him first Lord of the Admiralty, an office which he resigned in July of the same year, when the disruption of the Peel administration took place. In the Derby administration of 1858 he was again Minister for India, and the author of an India Bill, which failed to obtain the sanction of parliament. Having permitted a dispatch to see the light, in which he had administered a severe and caustic rebuke to Viscount Canning, Governor-general of India, an outcry was raised against him, which threatened the existence of the Derby government. To avert this result, Lord E. resigned. He has since taken a frequent and influential part in the debates of the Upper House. He is styled, by no less a judge than M. Guizot, 'the most brilliant of the Tory orators.' He has been twice married—first to a daughter of the Marquis of Londonderry, and second to the daughter of Admiral Digby. His divorce from the latter made some noise at the time. Should he die without issue, the earldom and viscounty will become extinct.

ELLENRIEDER, MARIE, a female painter of very high excellence, was born at Constance in 1791, studied in Munich, and in 1820 went to Rome, to perfect her knowledge of art. Her admiration of the old German masters gave a religious bent to her genius. On her return to Germany, she resided for some time at Carlsruhe, where she painted a 'Martyrdom of St Stephen' as an altar-piece for the Roman Catholic Church. She was afterwards appointed court-painter at Munich, but has since fixed her residence at Constance, and devoted herself exclusively to her profession. Among her principal pieces are the 'Transfiguration of St Barthelemy,' 'Christ Blessing Little Children,' 'Mary and the Infant Jesus,' 'Joseph and the Infant Jesus,' 'St Cecilia,' Faith, Hope, and Charity, and a Madonna. Marie E. is reckoned in Germany the greatest female artist of the present age. So full of ideal grace and beauty are the heads of her women and children, in particular, that it has been said that 'she seems to paint in the presence of angels;' her colouring, however, is gray, dull, and sombre, like that which prevails among the old masters of the German school.

E'LLESMERE, first EARL OF, politician, patron of the arts, and author. Francis Egerton, second son of the first Duke of Sutherland, was born 1800; graduated at Christ Church, Oxford, where he was second-class in classics, 1820; entered the House of Commons, 1820, and represented successively Bletchingly, Sutherland county, and South Lancashire; filled the office of Chief-secretary for Ireland from January 1828 to July 1830, and Secretary at War from July to November 1830; in 1833 assumed the name of Lord Francis Egerton, in lieu of his patronymic Leveson-Gower. He achieved considerable literary distinction as a writer of graceful poems, translations from the German, &c. He also published a pamphlet on the defenceless state of the coasts and of the metropolis, which called forth some adverse criticism. He was a munificent patron of the arts, and made many valuable additions to the collection of pictures which he inherited with the large estates of the last Duke of Bridgewater. He also built a noble gallery for their reception, which he liberally threw open to the public. After faithfully voting with the Conservative party in parliament for a quarter of a century, he, on the retirement of the Peel administration in 1846, obtained a revival in his favour of the peerages of Ellesmere and Brackley. His last public appearance was in May 1856, when he moved, in the House of Lords, an address to the crown, approving of the treaty of peace after the war with Russia. He died in 1857 at his new mansion, Bridgewater House, London, and was succeeded in the earldom by his eldest son, Viscount Brackley.

ELLESMERE, a town in the north-west of Shropshire, near a beautiful lake or mere, 19 miles north-north-west of Shrewsbury. Pop. 1861, 2114. It has considerable malting establishments. On the present site of a bowling-green once stood an ancient castle, alternately held by the English and Welsh.

E'LLIOT, EBENEZER, the CORN-LAW RHYMER, was born at Masborough, in Yorkshire, March 7, 1781. His father was a man of strong character and narrow opinions, and, as appears from Ebenezer's Autobiography (published in the *Athenæum* in 1850), exercised no little influence on his son's modes of thinking and sympathies. When a boy at school, E. was not a quick pupil; and even after his father had sent him to work in the iron-foundry where he himself held the situation of a clerk, the youth exhibited no fondness for reading. Before long, however, he entirely changed, and commenced to study Milton, Shakspeare, Ossian, Junius, and other authors. His first published poem was composed in his 17th year: it is entitled *The Vernal Walk.* This was succeeded by *Night*, *Wharncliffe*, &c. In 1821, E. began business as an iron-founder on his own account at Sheffield. He was very successful; and in 1841 retired to an estate which he had purchased at Great Houghton, near Barnesley, where he died 1st December 1849. E.'s principal productions are *Love*, accompanied with a letter to Lord Byron, his famous *Corn-law Rhymes*, *The Ranter*, and *The Village Patriarch*, a work full of noble and earnest poetry, all of which appeared between 1823—1830. In 1834, he issued a collected edition of his works, in 3 vols.; and in 1840, an edition in one volume. E. followed Crabbe, but with more depth and fire of feeling in depicting the condition of the poor as miserable and oppressed, tracing most of the evils he deplores to the social and political institutions of the country. The laws relating to the importation of corn were denounced by E. as specially oppressive, and he inveighed against them with a fervour of manner and a harshness of phraseology which ordinary minds feel as repulsive, even while acknowledged as flowing from the offended benevolence of the poet. But the glow of earnestness kindles his verse, and hides a multitude of faults. More enduring, however, than his rhyming philippics are his descriptions of English, and especially of Yorkshire scenery, and his delineations of humble virtue and affection. These are instinct with the purest spirit of poetry.

ELLI'PSE is the name of a figure in Geometry, important from its being the approximate shape of the planetary orbits. It is a curve of the second order, and is a conic section, formed by cutting a right cone by a plane passing obliquely through its opposite sides. It may be defined as a curve, the sum of the distances of every point in which from two fixed points within the curve is always the same. These two fixed points are called the foci; and the diameter drawn through them is the major axis; the minor axis bisects the major at right angles. The distance of either focus from the middle of the major axis is the *eccentricity*. The less the eccentricity is compared with the axis, the nearer the figure approaches to a circle; and a circle may be considered as an ellipse whose foci coincide.

There are various contrivances for describing an ellipse, called ellipsagraphs or *elliptic compasses*. The simplest method of description is to fix on a plane the two ends of a thread with pins in the foci, and make a pencil move on the plane, keeping the thread constantly stretched. The end of the pencil will trace an ellipse, whose major axis is equal to the length of the thread.

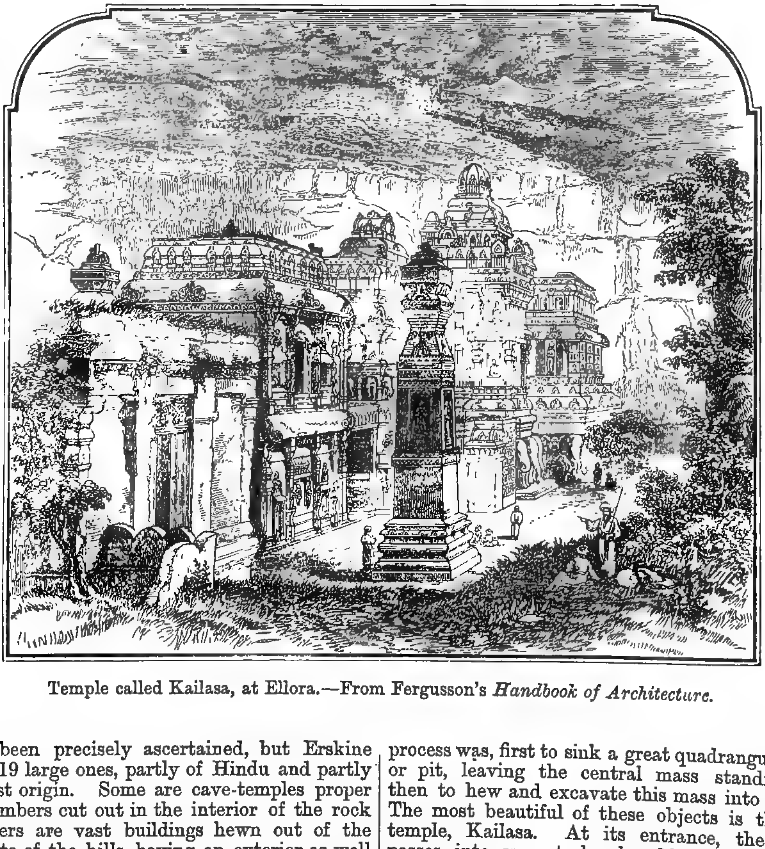
The equation to an ellipse (see Co-ORDINATES), referred to its centre as origin, and to its major and minor axes as rectangular axes, is $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, where a and b are the semi-major and semi-minor axes respectively. From this equation, it may be shewn, by the integral calculus, that the area of an ellipse is equal to πab; or is got by multiplying the product of the semi-major and semi-minor axis by 3·1416. It may also be shewn that the length of the circumference of an ellipse is got by multiplying the major axis by the quantity $\pi\left(1 - \frac{d^2}{2^2} - \frac{3d^2}{2^2.4^2} - \frac{3^2.5d^2}{2^2.4^2.5^2} - \&c.\right)$, where $d = \frac{1 - 4b^2}{4a^2}$.

ELLI′PSIS (Gr. omission) is a term used in Grammar and Rhetoric, to signify the omission of a word necessary to complete the expression or sentence in its usual form. The object of ellipsis is shortness and impressiveness; accordingly, it prevails in proverbs. Ellipses are used in all languages, but the same forms of ellipses are not common to all. Thus, 'the house we saw,' instead of 'the house *that* we saw,' is a kind of ellipsis peculiar, so far as we know, to English.

ELLI′PSOID is a surface of the second order, of which the Spheroid (q. v.) is a species, and the most interesting, from the fact of the form of the earth being spheroidal. The equation to an ellipsoid referred to its centre and rectangular co-ordinates is $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$.

ELLIPTI′CITY (of the Earth). See EARTH.

ELLO′RA, a decayed town in the dominions of the Nizam, not far from the city of Dowlatabad, in lat. 20° 2′ N., and long. 75° 13′ E. It is celebrated for its wonderful rock-cut temples. Their number has not been precisely ascertained, but Erskine reckoned 19 large ones, partly of Hindu and partly of Buddhist origin. Some are cave-temples proper —i. e., chambers cut out in the interior of the rock —but others are vast buildings hewn out of the solid granite of the hills, having an exterior as well as an interior architecture, and being, in fact, magnificent monoliths. In executing the latter, the process was, first to sink a great quadrangular trench or pit, leaving the central mass standing; and then to hew and excavate this mass into a temple. The most beautiful of these objects is the Hindu temple, Kailasa. At its entrance, the traveller passes into an antechamber 138 feet wide by 88 deep, adorned by numerous rows of pillars. Thence he proceeds along a colonnade over a bridge into



Temple called Kailasa, at Ellora.—From Fergusson's *Handbook of Architecture*.

a great rectangular court, which is 247 feet in length and 150 broad, in the centre of which stands the temple itself, a vast mass of rock richly hewn and carved. It is supported by four rows of pilasters, with colossal elephants beneath, and seems suspended in the air. The interior is about 103 feet long, 56 broad, and 17 high, but the entire exterior forms a pyramid 100 feet high, and is overlaid with sculpture. In the great court are numerous ponds, obelisks, colonnades, sphinxes, and on the walls thousands of mythological figures of all kinds, from 10 to 12 feet in height. Of the other temples, those of Indra and Dumarheyna are little inferior to that of Kailasa. Regarding their antiquity and religious significance, authorities are not agreed; but at all events they must be subsequent to the epic poems *Ramayana* or *Mahabharata*, because they contain representations taken from these poems, and also to the cave-temples at Elephanta, because they exhibit a richer and more advanced style of architecture.

ELLO'RE, a town of the district of Masulipatam, in the presidency of Madras, stands in lat. 16° 42′ N., and long. 81° 10′ E. In an official report, the place has been indefinitely styled 'populous.' Independently of its population, properly so called, E., as a military station, has a considerable garrison. It occupies both banks of the Jummulair, a torrent of the Eastern Ghauts, which, instead of reaching the Bay of Bengal, loses itself three miles further down, in the land-locked Colair Lake. In fact, for about 50 miles to the westward of the sea, the neighbouring country is depressed below the level of the maritime belt, the stagnant pool above mentioned not only having independent feeders of its own, but also receiving supplies, in the season of high-water, from the Kistnah or Krishna, and the Godavery. Under such circumstances, the climate of E. is at once unpleasant and unhealthy. During the south-west monsoon, bringing with it, of course, the accumulated heats of the whole breadth of the peninsula, the temperature is more particularly oppressive, having been known to rise, in the night, to 120° F.

E'LLSWORTH, a small but flourishing town of North America, in the state of Maine, on both sides of the navigable river Union, 30 miles south-east of Bangor, and about 4 miles west of Frenchman's Bay. It exports 50,000,000 feet of timber annually, carries on cod and mackerel fisheries, and had, in 1854, 5000 inhabitants.

ELM (*Ulmus*), a genus of trees of the natural order *Ulmaceæ*, natives of temperate climates, with serrated leaves unequal in their two sides, and small flowers growing in clusters appearing before the leaves, and containing 4—12 stamens and one germen. The fruit is a samara, or compressed one-seeded little nut, winged all around. One of the most important species is the COMMON SMALL-LEAVED or ENGLISH ELM (*U. campestris*), a tree of 60—80 feet in height, with ovato-elliptic, doubly serrated leaves, and flowers almost destitute of stalks. The wood is compact, and very durable in water. The tree is diffused all over Europe; is found also in the west of Asia and north of Africa, and is used for a great variety of purposes by wheelwrights, machine-makers, ship and boat builders, &c.; it is also prized by joiners for its fine grain, and the mahogany colour which it readily assumes on the application of an acid. It is reckoned superior to the wood of any other species of elm. The bark is used in dyeing and in sugar-refining, and, in times of scarcity, has been used in Norway for grinding into meal and mixing in bread, which has a less disagreeable taste than that made from meal mixed with fir-bark. The inner bark is used medicinally in cutaneous diseases; it is mucilaginous, and has a bitter astringent taste. The ELM BALSAM (*Beaume d'orme*), which was formerly in great repute, is a brownish substance, which is found in dried galls of the leaves in the south of Europe, Persia, &c. From these galls, in an earlier stage, flows a clear, viscid, sweetish liquid, called Elm Water (*Eau d'orme*), which is used for washing wounds, contusions, and sore eyes.—The seeds of the elm are eagerly eaten by pigeons and common poultry. The elm is one of the principal timber trees of Britain, most extensively planted, and a chief ornament of English scenery.—The CORK-BARKED ELM (*U. suberosa*), by many regarded as a variety of *U. campestris*, is distinguished by the corky wings of the bark of the branches. It is a taller and more spreading tree, with much larger leaves. It is a European tree, common in plantations in Britain, but a doubtful native.—The DUTCH CORK-BARKED ELM (*U. major*) is also looked upon by many as a variety of *U. campestris*. It is still more corky in its bark, and has still larger leaves. It is of very quick growth, but the wood is very inferior.—The BROAD-LEAVED or WYCH ELM (*U. montana*) is the only species that can with certainty be regarded as indigenous to Scotland. It has rough and broad leaves, a stem less upright than the English elm, and large spreading branches. The wood is used for all the purposes of the English elm. The tree is of very quick growth. Protuberances of gnarled wood are not unfrequently produced, which are finely knotted and richly veined; they are much esteemed for veneering, and are sometimes very valuable. Varieties of this species are known as the GIANT ELM and CHICHESTER ELM.—The SMOOTH-LEAVED ELM (*U. glabra*) is by some regarded as a variety of *U. montana*, but is distinguished, besides other characters, by smooth leaves, which are much smaller. It is a native of England. A variety called the HUNTINGDON ELM is much esteemed.—The CORNISH ELM (*U. stricta*), found in the south-west of England, is remarkable for its rigid, erect, and compact branches.—Very different is the habit of *U. effusa*, a continental species with a large spreading head and smooth bark, distinguished also by the long stalks of its flowers and its ciliated fruit.—The AMERICAN or WHITE ELM (*U. Americana*), which abounds in the

Common English Elm (*Ulmus campestris*).

basin of the Mississippi, and attains its loftiest stature between lat. 42° and lat. 46°, is a magnificent tree, sometimes 100 feet in height, the trunk reaching 60 or 70 feet before it separates into branches, and the widely diffused pendulous branches floating gracefully in the air; but the timber is not much esteemed.—The Red or Slippery Elm (*U. fulva*) is also common in the basin of the Mississippi as far south as lat. 31°, and in the western parts of Canada. It attains a height of 50 or 60 feet. The wood is more valuable than that of the last species, but much inferior to the English elm. The leaves and bark yield an abundant mucilage, which is bland and demulcent, and esteemed a valuable remedy in catarrh, dysentery, and other complaints.—The Wahoo or Winged Elm (*U. alata*) is a small tree, found from lat. 37° to Florida, Louisiana, and Arkansas, remarkable for the branches being furnished on two opposite sides with wings of cork. The wood is fine-grained, compact, and heavy.—*U. Chinensis* is a Chinese species of elm, the leaves of which often bear galls used by the Chinese in tanning and dyeing.

The name Spanish Elm is given in the West Indies to a tree also called Bois de Chypre, *Cordia Gerascanthus*, of the natural order *Cordiaceæ*, the timber of which is valuable; also to *Hamelia ventricosa*, of the natural order *Rubiaceæ*, the timber of which is known to cabinet-makers as Prince-wood.

ELMI′NA, a fortified town and seaport of West Africa, capital of the Dutch settlements on the Gold Coast, is situated in an undulating and thickly wooded district, in lat. 5° 10′ N., and long. about 1° 40′ W. It is a large, irregularly built, and extremely unclean native town, and seems to be entirely destitute of any noteworthy architectural features. The inhabitants consist chiefly of traders, fishermen, and artisans. A few miles to the east is Cape Coast Castle. E. was first established by the Portuguese in 1481, and was the first European settlement planted on the coast of Guinea. It was taken by the Dutch in 1637, and, four years after, was finally ceded to them by the crown of Portugal. Pop. estimated at from 8000 to 10,000.

ELMI′RA, a town of New York state, contains, according to the census of 1860, 8682 inhabitants. In point of situation, it possesses both natural and artificial advantages. It stands on the Chemung, a navigable feeder of the Susquehanna; it is connected by a canal with Seneca Lake and the interior of Pennsylvania, and it is intersected by the railway which, with a length of 460 miles, connects Jersey City, virtually a suburb of New York, and Dunkirk on Lake Erie. E. is 273 miles distant from the capital of the state.

E′LMO'S FIRE, St, is the popular name of an appearance sometimes seen, especially in southern climates during thunder-storms, of a brush or star of light at the tops of masts, spires, or other pointed objects. It is sometimes accompanied by a hissing noise, and is evidently of the same nature as the light caused by electricity streaming off from points connected with an electrical machine. See Electricity. The phenomenon, as seen at sea, was woven by the Greeks into the myth of Castor and Pollux; and even yet such lights at the mast-head are considered by sailors a sign that they have nothing to fear from the storm.

ELMSHORN, a town of Denmark, in the duchy of Holstein, 20 miles north-west of Hamburg, is situated on both banks of the Krückau, a navigable stream, and feeder of the Elbe. It is well built, has considerable manufactures, and an active trade in grain; it has also a boat-building yard, and some tanneries. Vast numbers of boots and shoes are made at E., and are sold at all the fairs in the duchies of Slesvig and Holstein. Many Jews reside here, as this is one of the few places in the duchies in which they are allowed to settle without having previously obtained permission. E. has an important annual cattle-market. Pop. 4461.

EL OBEID. See Il Obeid, or Lobeid.

ELOCU′TION (Lat. for speaking out), the art of effective speaking, more especially of public speaking. It regards solely the utterance or delivery; while the wider art of oratory, of which elocution is a branch, takes account also of the matter spoken. The art of elocution held a prominent place in ancient education, but has been greatly neglected in modern times. See Reading and Speaking.

ÉLOGE. When a member of the French *Académie* dies, it is customary for his successor to deliver an oration, setting forth his merits and services. This is called an *éloge* (Lat. *elogium*, Gr. *eulogia*, praise), and a considerable branch of French literature goes by the name. Many of the French éloges are mere florid panegyrics; but others, particularly those written by Thomas, D'Alembert, Bailly, Condorcet, Cuvier, and other eminent savants, are interesting and valuable biographies. The proper epoch of the éloge began with Fontenelle (2 vols., Par. 1731), who was distinguished for clearness, ease, and elegance. His successors have tried to outshine him in pomp of language.

ELOHIM, Hebr., plural of *Eloăh*, Arab. *Ilâh*, Chald. *Elâh*, Syr. *Alôh*, might, power; in plur., intensified, collective, highest power—great beings, kings, angels, gods, *Deity*. As a *pluralis excellentiæ* or *majestatis*, and joined to the singular verb, it denotes, with very rare exceptions, *the One*, true God. Joined to the plural verb, however, it usually means gods in general, whether including the One or not. It is mostly used (in the singular sense) for or together with Jehovah (the Everlasting One); but some portions of the Scriptures employ exclusively either the one term or the other. This circumstance has given rise to endless discussions, and has also suggested amongst others the notion of different authors of Genesis. On this, and on the relation of those two words to each other, see the article Jehovah. We shall only mention here the hitherto unnoticed opinion of the Talmudists, that Elohim denotes the Almighty under the aspect of a God of strict justice; Jehovah, of clemency and mercy. As important for the history of the word Elohim, we may add, in conclusion, that it was very probably Petrus Lombardus who first tried to prove the Trinity out of this plural form—an attempt which, although unanimously and scornfully rejected by all scholars, from Calvin, Mercerus, Calixtus, the younger Buxtorf, &c., to our times, has lately been revived by Rudolf Stier, who has gone so far as to invent a new grammatical term, '*Pluralis Trinitatis*,' for this purpose. See also the articles Shemitic Plural and Pentateuch.

ELONGA′TION, Angle of, is the angle measuring the distance between two stars, as seen from the earth. Usually, it is employed only in speaking of the distance of planets from the sun; the word 'distance' being used instead of the word elongation, in regard to fixed stars and planets, as related to one another.

ELO′PEMENT. See Adultery.

EL PA′SO DEL NO′RTÉ (in English, *the Pass of the North*) is a narrow valley of nine or ten miles in length, near the north-eastern extremity of the republic of Mexico. It is situated within the state of Chihuahua (q. v.), in lat. 31° 42° N., and long. 106° 40′ W., being on the right bank of the

Rio Grande, or Rio Bravo del Norte, about 1420 miles from its mouth. It is remarkably fertile, yielding, in particular, considerable quantities of wine and brandy. It contains about 5000 inhabitants, nearly all of them of mixed blood. In fact, the people are little better than the aboriginal savages, being almost destitute of the most ordinary appliances of civilised life. The place is worthy of notice chiefly as the main thoroughfare between New Mexico and Mexico Proper.

E'LPHIN, a bishop's see in Ireland, united to Kilmore in 1833.

E'LPHINSTONE, WILLIAM, a celebrated Scottish prelate, and founder of King's College, Aberdeen, was born in the year 1430 or 1431. He was the son of William Elphinstone, Rector of Kirkmichael, and Archdeacon of Teviotdale, and, as the marriage of ecclesiastics was then prohibited, his birth was illegitimate. E. studied at the university of Glasgow, where he took his degree of M.A. at the age of twenty-four, at the same time that he took priest's orders. He seems to have acted as his father's curate at Kirkmichael, for four years, but being strongly attached to the study of law (he had practised as an advocate in the church courts before this), he went to France in his twenty-ninth year, at the instigation of his uncle, Laurence Elphinstone, who supplied him with the means of studying at the most celebrated schools of the continent. E. so highly distinguished himself, that after three years he was appointed professor in the university of Paris, and afterwards at Orleans, which had then the highest reputation as a legal school. So greatly were his learning and talents appreciated, that the parliament of Paris used to ask his opinion on great questions. After a residence of nine years abroad, he returned to Scotland, and was made successively official-general of the diocese of Glasgow (1471—1472), rector of the university (1474), and official of Lothian in 1478, 'then probably,' says Mr Cosmo Innes (*Sketches of Early Scottish History*, Edin. 1861), 'the second judicial office in the kingdom, which he filled for two years, sitting in parliament, and serving on the judicial committees, which formed the supreme civil jurisdiction in Scotland.' His dignity, learning, and prudence, now began to procure him universal respect. He was the principal member of a great embassy sent from Scotland to France, to settle certain disputes that had sprung up between the two countries, and threatened the stability of their ancient alliance. In this important affair, he was eminently successful. On his return, he was made Bishop of Ross in 1481. In 1483, he was removed to the see of Aberdeen; and between this period and the death of James III. he was several times engaged in embassies to France, England, Burgundy, and Austria. For a few months before the death of that monarch, he held the office of chancellor of the kingdom. He lost this great office on the accession of James IV., but, says the authority already quoted, 'he was speedily restored to favour, and to the royal councils, and seems to have been keeper of the Privy Seal from 1500 till his death.' He did not suffer his office to withdraw him from the care of his diocese, where he applied himself to the faithful discharge of his episcopal functions, endeavouring to reform the clergy, the service, and the ritual of his church. He next concluded (while on a mission to the continent for another purpose) a treaty with Holland, which was beneficial to Scotland. E. seems to have had a genuine desire for the enlightenment and improvement of his countrymen. Whenever leisure permitted, we find him engaged in devising means to this end. It appears to have been chiefly through his influence that the first printing-press—that of Chepman and Millar—was established in Scotland. He superintended the preparation and printing of the *Breviary of Aberdeen*, and collected the materials for the lives of the Scottish saints contained in that work. He procured from the pope (Alexander VI.) a bull for erecting a university in Aberdeen. The bull was sent in 1494, but the college was not founded till 1500, when it was dedicated to St Mary—a name afterwards changed to King's College. E. built also the great central tower and wooden spire of his cathedral church at Aberdeen, provided its great bells, covered the roofs of its nave, aisles, and transept with lead; and, at his own expense, built a stone bridge over the Dee for the benefit of his townsmen. The fatal battle of Flodden, 9th September 1513, broke the spirit of E., who was never seen to smile after. He died 25th October 1514, and was buried before the high altar of the chapel of the college which he founded. E. was a man of great vigour of mind and nobleness of nature—'one of those prelates,' says a writer in the *Quarterly Review* (No. clxix. p. 141), 'who in their munificent acts, and their laborious and saintly lives, shewed to the Scottish church, in her corruption and decay, the glorious image of her youth.' 'We know him,' says Mr Innes, 'in the history of the time as the zealous churchman, the learned lawyer, the wise statesman; one who never sacrificed his diocesan duties to mere secular cares, but knew how to make his political eminence serve the interests of his church; who, with manners and temperance in his own person, befitting the primitive ages of Christianity, threw around his cathedral and palace the taste and splendour that may adorn religion, who found time, amidst the cares of state, and the pressure of daily duties, to preserve the Christian antiquities of his diocese, and collect the memories of those old servants of truth who had run a course similar to his own; to renovate his cathedral service, and to support and foster all good letters, while his economy of a slender revenue rendered it sufficient for the erection and support of sumptuous buildings and the endowment of a famous university.' Some volumes of notes made by E. when studying in the law schools, are preserved in the library of the University of Aberdeen. A transcript of Fordun's *Scotichronicon*, with some additions, in the Bodleian Library at Oxford, was long erroneously ascribed to him. His *Breviarium Aberdonense*, printed in 1509—1510, was reprinted in two volumes quarto at London in 1853.

EL ROSA'RIO, a small town of the Mexican Confederation in the state of Cinaloa, is situated 55 miles east-north-east of Mazatlan. It is important chiefly as being a commercial entrepôt between Mazatlan and the interior. Pop. 5000.

ELSINO'RE, a town and seaport of Denmark, on the island of Seeland, is situated on the western shore of the Sound, and at its narrowest part, 3½ miles west-south-west of the town of Helsingborg in Sweden, and 24 miles north of Copenhagen. Lat. 56° 2′ N., long. 12° 36′ E. The town, which has been in recent times considerably improved, is spacious, and consists of one long principal street, with several lateral branches. The cathedral, containing some fine tombs, many of them very old, may be considered as one of the most interesting edifices. At a short distance to the east of E. are the castle and the fortress of Kronborg, the former a white stone building in the Gothic style, and the latter, a stronghold mounted with guns that command the Sound in all directions. To the north-west of E., and in its immediate vicinity, is the royal château of Marienlist, the pleasure-grounds of which, occupying the crest of a hill, are open to the public. From the grounds of Marienlist, magnificent views may be had of the Sound, of Helsingborg, and of the plains of Sweden. The harbour of E., formed by a wooden pier, is accessible to ships of light draught. E. has a brisk foreign trade, and has, besides, manufactures of straw-hats, arms, sugar, brandy, &c., also cotton-printing and fisheries. The Sound Dues (q. v.) were collected here. Pop. 9097.

Saxo Grammaticus, a famous writer of the 12th c., was born here. Here Shakspeare laid the scene of his *Hamlet*, a perversion of history on the part of the great dramatist, as Jutland, not Seeland, was Hamlet's country. The vaults under the castle of Kronborg were supposed to be the residence of Holger Danske, the mythic hero of Denmark, who never appeared above ground save when the country was in danger, and was then supposed to march at the head of the Danish armies. In severe winters the Sound is frozen over at E., so that one can walk over the ice from Denmark to Sweden.

E'LSSLER, Fanny, a celebrated dancer, was born at Vienna in the year 1811, and educated at Naples for the ballet, along with her elder sister Theresa. The first triumph of the sisters took place at Berlin, where they appeared in 1830. The reputation acquired by Fanny in Berlin preceded her to Italy, America, England, and St Petersburg, where her beauty, amiability, and mastery in her art, charmed all classes of society. In 1841, the two sisters went to America, where they excited unwonted enthusiasm. After Fanny had earned laurels in St Petersburg, she returned, in 1851, to Vienna, to take a final leave of the stage. She then retired to Hamburg, where she still resides on a small estate purchased by her beyond the Dammthore. Theresa was less graceful in her motions than her sister, but exhibited great strength, boldness, and agility. On the 25th April 1851, she became the wife of Prince Adalbert of Prussia, and was ennobled by the king of Prussia.

E'LSTER, the name of two rivers of Germany, the White and the Black Elster. The White E. rises at the foot of the Elster mountains, on the north-western boundary of Bohemia, flows in a northerly direction, and falls into the Saale three miles south of the town of Halle, in Prussia. Its chief affluent is the Pleisse from the right. Total length, 110 miles. The Black E. rises in the kingdom of Saxony, within two miles of Elstra, flows north-west, enters Prussia, and joins the Elbe eight miles south-east of Wittenberg. Length, 105 miles.

ELSTRACKE, Reginald or Renold, an English engraver, who flourished about 1620. He worked chiefly for the booksellers, and his plates, which are executed with the graver, without etching, are almost entirely confined to portraits. Prints from his plates are much sought after, not only from their scarcity, and as illustrating English history, but as works of art, in which much character is expressed in a firm and forcible manner. When he did not sign his plates with his name, he marked them with his initials, R. E.

ELTO'N, a famous salt lake of Russia, is situated in the government of Saratov, 170 miles south-south-east from the town of that name, the lat. of its centre being 48° 56′ N., and the long. 46° 40′ E. Its longest diameter is eleven miles, and its shortest about nine miles. It has a superficial extent of 45,500 English acres, but at no place is it more than about 15 inches in depth. It is of an oval form, and can be easily reached from the south, but the northern banks rise so rapidly that access to it from that quarter is difficult. In the hottest season, so wonderful is the illusion produced by the crystallised salt, that the lake seems covered with snow and ice. E. yields about 100,000 tons of salt annually, in the collection of which about 10,000 persons are employed.

ELUTRIA'TION is the term applied to the process of separating, by means of water, the finer particles of earths and pigments from the heavier portions. The apparatus generally used is a large vat, in which grinding wheels revolve, and the substance to be reduced to powder being placed in the vat along with water, the wheels in revolving not only pulverise the material, but from their motion being communicated to the water, the latter is enabled to retain in mechanical suspension the finer particles of the clay, &c. By allowing a stream of water to flow in and out of the vat, the finer particles can be constantly floated away, and the liquid being run into settling vats, the fine powder settles to the bottom, when the water can be run off from the surface. This process is much employed in the manufacture of the materials used in pottery, and in the preparation of pigments.

E'LVANS are veins of a granular crystalline mixture of felspar and quartz, probably proceeding from a granite mass, which are found in granite rocks and fossiliferous slates in Cornwall, Devon, and the south of Ireland.

E'LVAS, an episcopal city and fortress of Portugal, stands in a very fruitful district on the eastern frontier of the province of Alemtejo, 10 miles west of Badajoz, and 40 miles north-east of Evora. It is the strongest fortress in Portugal, and one of the strongest in Europe. It is built upon a precipitous hill; is surrounded by walls, and by a glacis and covered-way. Besides these, E. has other defences in two formidable forts, Fort Sta. Lucia, and Fort Lippe, the former to the south, and the latter—almost entirely shell-proof—to the north of the city. E. is an old town; many of its houses are badly built. Its most striking architectural feature is an enormous aqueduct, which conveys water to it from a distance of three miles. This aqueduct consists of four tiers of arches built upon one another, and rising to the height of about 250 feet. The chief manufactures of E. are arms and jewellery. There are here extensive store-houses filled with British manufactures, and the inhabitants, by illegally selling these goods within the Spanish frontier, realise considerable wealth. Pop. 12,400.

E. has undergone many sieges, but has never been taken. The Spaniards besieged it in 1385, and again in 1659, when a famous battle took place called the Lines of Elvas, in which the Portuguese, though greatly inferior in numbers, drove the Spaniards from their lines in front of the town. E. was raised to the rank of a city by D. Manoel, king of Portugal, in 1513.

ELVES. See Fairies.

E'LY, so called from a Saxon word, *elig*, an eel, or *helig*, a willow, may be called a cathedral town rather than a city, and is situated on an eminence in that part of the fen-country of Cambridgeshire called the *Isle of Ely*. Pop. about 6000. The Eastern Counties and the Great Northern Railways have each stations, the former outside, the latter in the town.

Ely Cathedral.—About the year 673, Etheldreda, daughter of the king of East Anglia, and wife of Oswy, king of Northumberland, founded a monastery here, and took on herself the government of it. Two hundred years afterwards (870), the Danes ravaged the Isle, and destroyed the monastery, which was rebuilt in 970 by St Ethelwold, Bishop of Winchester; and this continued till 1081, when a new church was begun, which was converted into a cathedral, and the abbey erected into a see in 1109. The possessions of the abbey were divided between the bishop and the community. The cathedral contains some beautiful specimens of architecture, especially of Early Norman. Its exterior dimensions are 535 feet from west to east. The great cross or main transept is 190 feet. The turrets of the west tower are 215 feet high, and the lantern over the central tower 170 feet. The west front was built by Geoffry Ridel, the third bishop, who died in 1189, and is of Norman work. About 200 years after his time, an addition of 64 feet was made to the tower, and over that a spire. This great superincumbent weight crushed the north-west transept, and the south-west one, which still remains, was considerably weakened. In front there is a west portico or galilee (q. v.), of Early Gothic, said to be the work of Bishop Eustachius. The nave is of Norman work, and was completed about 1174. The columns are alternately round and octagonal. The roof was, in 1861, beautifully painted. The transepts, which are the most ancient parts of the church, were built in the reign of Henry I. They had originally a middle and two side aisles, but the latter are, in the south transept, walled up, and the space used as a vestry and library. Originally there stood a square tower in the centre of the building, opening into the nave and transepts; but this gave way in 1322, and fell eastwards, crushing three arches of the choir. The repair of this dilapidation was undertaken by the sacrist of that time, Alan de Walsingham. The design was original, an octagon tower with four longer and four shorter sides, surmounted by a lantern. The upper part of this, which is of timber, is about to be rebuilt as a memorial to the late Dean Peacock.

The choir contains some rich varieties of decorated Gothic, and the fine shafts of Purbeck marble combine beautifully with the white stone work. The whole has lately been restored and beautified. Originally, it was much shorter eastwards, and protruded into the nave, but in 1235 the semicircular end of the old church was taken down, and six arches added by Hugh de Northwold. At the dedication and removal of the relics, Henry III. and his court were present. The east end is eminently beautiful: it consists of two tiers of high lancet-shaped windows. Perhaps the most interesting and yet beautiful part of the building is the Lady Chapel—an incomparable work, irreparably spoiled by the barbarism of Puritan times. It was begun in 1321, and finished in 1349, simultaneously with the rebuilding of the central tower and ruined choir, a circumstance highly illustrative of the taste and munificence of the times. It has a stone roof, like King's College Chapel in Cambridge, which it is supposed to have suggested, and the walls were once decorated from top to bottom with countless niches and images of saints and martyrs, not one of which remains undefaced. Its length is 100 feet; width, 46; height, 60. Bishop Alcock's Chapel, in which he lies buried, is at the east end of the north aisle—an overloaded specimen of the richest florid Gothic. Bishop West's Chapel, at the east end of the south aisle, is a more pleasing example of the same style.

Amongst the celebrated names connected with E. are Abbot Thurstan, who defended the Isle against William the Conqueror for seven years; Longchamp, chancellor and regent under Richard I.; Chancellor Morton, Simon Patrick, and Bishop Andrews. The bishops of E., like the bishops of Durham, formerly enjoyed a palatine jurisdiction, and appointed their own chief-justice, &c.; but this privilege was taken from them by the 6th and 7th Will. IV. The Bishop of E. is visitor to St Peter's, St John's, and Jesus Colleges, Cambridge, of which last he also appoints the master. There is a grammar-school attached to the Cathedral, founded by Henry VIII. There are some interesting remains of the old conventual buildings in the neighbourhood of the Cathedral.

ELY, Isle of, the south part of the Bedford Level, or the part of Cambridgeshire north of the Ouse. It includes above a half of this county, is 24 miles long from north to south, with an average breadth of 14 miles, and contains four hundreds. It consists of a monotonous, marshy, or fenny plain, formerly covered with water, and abounding in aquatic birds and plants. It chiefly consists of black earth and turf, and, where well drained by innumerable artificial canals and ditches, it produces fine crops of hemp, flax, wheat, oats, and cole seed. Over it are interspersed small eminences, generally crowned with villages and towns, as Ely City, March, Thorney, Whittlesea, and Wisbeach. Pop. about 60,000.

E'LYMUS. See Lyme Grass.

ELY'SIUM (Gr. *elusion*), a place in the infernal regions of the ancient classical mythology, where the souls of the good dwell after death. In the *Odyssey*, Homer describes it as a place where the souls of the departed lived in ease and abundance among innocent pleasures, and enjoying a mild and wholesome air. In the *Iliad*, however, he gives a sombre view of the state of the departed souls. Achilles, though in Elysium, is made to envy the life of the meanest hind on earth. By succeeding poets, the bliss of Elysium is drawn in much more lively colours. Besides the amenity and various delights of the place, diverse employments are found for the inhabitants, according to the ruling passion of each while on earth. Elysium was supposed by some writers to be in mid-air, by others in the sun, by others in the centre of the earth, next Tartarus, by others, in the Islands of the Blest.

ELZEVIER, or ELZEVIR, the name of a celebrated family of printers at Amsterdam, Leyden, and other places in Holland, whose beautiful editions were chiefly published between the years 1583 and 1680. Louis, the first of them, is said to have been born at Louvain about the year 1540. He was induced by religious disturbances to leave his native city, and in 1580, he settled as a bookbinder and bookseller in Leyden, where he died about 1617. The first work edited by him bears the title *Drusii Ebraicorum Quæstionum ac Responsionum Libri Duo, videlicet Secundus ac Tertius, in Academia Lugdunensi* MDLXXXIII. *Veneunt Lugduni Batavorum apud Elseuirium e Regione Scholæ Novæ.* The second, a Eutropius by P. Merula, bears the date 1592, and was long erroneously believed to be the first that issued from E.'s press. Five out of Louis's seven sons continued to carry on their father's business. Their names were Matthew, Louis, Aegidius, Jodocus (Joost), and Bonaventura. The last, in conjunction with his nephew Abraham E. (a son of Matthew), prepared the smaller editions of the classics, in 12mo and 16mo, which are still valued for their beauty and correctness. It is mainly on these that their reputation is based. The house of E., in Amsterdam, was established by Louis, the son of Jodocus E., in 1638. Peter E., grandson of the last mentioned, carried on the bookselling business in Utrecht, and died in 1696. For more than a century, however, this family has ceased to have any connection with book-printing. It is represented at present by Rammelmann Elzevier, whose father was governor of the isle of Curaçao, and died in 1841. The Elzevier editions of Virgil, Terence, and other Roman classical authors, as well as of the New Testament, the Psalter, &c.,

are unrivalled both for beauty and correctness. It is said that the Elzeviers generally employed women to correct the press, under the conviction that they would be less likely than men, on their own responsibility, to introduce alterations into the text. Compare Adry, *Notice sur les Imprimeurs de la Famille des Elzeviers* (Paris, 1806), and Pieter's *Annales de l'Imprimerie Elsévirienne* (Ghent, 1851—1852).

EMACIA'TION (Lat. *macies*), leanness. See Phthisis, Tabes, Consumption.

EMANA'TION means, in general, efflux or issue. In theology and philosophy, it indicates an ancient doctrine, which considered all things as emanating or flowing from a Supreme Principle. According to this doctrine, the origin of things is only an overflowing of the divine fulness—an outstreaming of the light from the necessity of its nature, and not any free action on the part of God. What is thus given off as a copy from original perfection, departs more and more from its source, and gradually degenerates, which was thought to account for the origin of evil. This doctrine came from the East, and pervades the Indian mythology, the system of Zoroaster, and the Neo-Platonic philosophy of Alexandria. In Christian theology, the idea of emanation has been applied to explain the relation among the persons of the Trinity.

EMANCHÉ. See Manche.

EMANCIPA'TION. See Slavery.

EMANCIPATION, in the Roman law, was the act by which the *Patria Potestas* (q. v.), or paternal authority, was dissolved in the lifetime of the father. It took place in the form of a sale (*mancipatio*) by the father of the son to a third party, who manumitted him. The Twelve Tables required that this ceremony should be gone through three times, and it was only after the third sale that the son became *sui juris* under his own law. In general, the son was at last resold to the father, who manumitted him, and thus acquired the rights of a Patron (q. v.), which would otherwise have belonged to the alien purchaser who finally manumitted him. In the case of daughters and grandchildren, one sale was sufficient. If the child died intestate, or if he required a tutor or curator, the father's rights as patron came into play; but if the father died intestate, the son took nothing, because he was out of his family. But this rigour of the old law was modified by the prætor's edict, which placed all the children on the same footing. In the law of Scotland, emancipation is called Foresfamiliation (q. v.). The only case in which the term is employed in England is with reference to poor-law settlements. See Settlement, Poor.

EMANCIPATION, Catholic. See Roman Catholic Emancipation.

EMA'NÜEL I., king of Portugal, styled the Great, and sometimes, likewise, the Fortunate, was born on the 3d May 1469, and succeeded John II. in 1495. Before his accession to the throne, he bore the title of Duke of Beja. On his accession, he prepared the code of laws which bears his name, and rendered himself remarkable by his zeal and exertions in the cause of education, by his active piety, and by his predilection for the society of artists and scholars. Through his exertions, Portugal became the first naval power of Europe, and the centre of the commerce of the world. He despatched Vasco de Gama to sail round the Cape of Good Hope, and discover the passage to India. Cabral was commissioned by him to prosecute the discoveries of Vasco de Gama still further, and Corte Real to sail along the coasts of North America. The expeditions under Albuquerque put E. in possession of the south coast of Africa and of the Indian Archipelago. Not satisfied with this, he opened a communication with Persia, Ethiopia, and, in 1517, with China. At his death, 13th December 1521, Portugal was in possession of a large fleet, strong fortresses, well-furnished arsenals, a warlike army, a flourishing trade and commerce, and extensive colonies. His reign has been termed the golden age of Portugal. E. was thrice married: first to Isabella, the daughter of Ferdinand; afterwards to Mary of Castile, her sister (by whom he had two children, John and Isabella, the former of whom succeeded him on the throne); and thirdly, to Eleanore of Austria, sister of Charles V.

EMA'RGINATE. See Leaves.

E'MBA, a river of Turkistan, in the Kirghiz territory, rises at the western base of the Muehajar or Mongojar Mountains, and flowing in a south-west direction, enters the Caspian Sea after a course of about 300 miles.

EMBA'LMING, the art of preserving the body after death, invented by the Egyptians, whose prepared bodies are known by the name of mummies, and are called in the hieroglyphs *sahu*, and by St Augustine *gabbaroe*. This art seems to have derived its origin from the idea, that the preservation of the body was necessary for the return of the soul to the human form after it had completed its cycle of existence of three or ten thousand years. Physical and sanitary reasons may also have induced the ancient Egyptians; and the legend of Osiris, whose body, destroyed by Typhon, was found by Isis, and embalmed by his son Anubis, gave a religious sanction to the rite, all deceased persons being supposed to be embalmed after the model of Osiris in the *abuton* of Philæ. The art appears as old as 2000 B. C., at least the bodies of Cheops, Mycerinus, and others of the age of the 4th dynasty having been embalmed. One of the earliest recorded embalmments on record is that of the patriarch Jacob; and the body of Joseph was thus prepared, and transported out of Egypt. The process has been described by Herodotus and Diodorus; but their accounts can only refer to their own age, and are only partially confirmed by an examination of the mummies. The following seems to have been the usual rule observed after death. The relations of the deceased went through the city chanting a wail for the dead. The corpse of a male was at once committed into the charge of the undertakers; if a female, it was retained at home till decomposition had begun. The *paraschistes*, or flank-inciser of the district, a person of low class, whose establishment was situated in the cemeteries or suburbs, conveyed the corpse home. A scribe marked with a reed-pen a line on the left side beneath the ribs, down which line the paraschistes made a deep incision with a rude knife or Ethiopian stone, probably flint. He was then pelted by those around with stones, and pursued with curses. Another kind of embalmer, the *taricheutes*, or preparer, then proceeded to remove the entrails and lungs, with the exception of the heart and kidneys. The brain was extracted by another taricheutes, by a crooked instrument, through the nose. All this having been effected, the body was ready for the salts and spices

Egyptian Mummy.

necessary for its preservation, and the future operations depended upon the sum to be expended on the task. When Herodotus visited Egypt, three methods prevailed: the first, accessible only to the wealthy, consisted in passing peculiar drugs through the nostrils into the cavities of the skull, rinsing the belly in palm-wine, and filling it with resins, cassia, and other substances, and stitching up the incision in the left flank. The mummy was then steeped in natron for seventy days, and wrapped up in linen, cemented by gums, and set upright in a wooden coffin against the walls of the house or tomb. This process cost a silver talent, which, considering the relative value of ancient money at one-third of that at present, would amount to about £725. The second process consisted in removing the brain, as before, but only injecting the viscera with *kedrion*, or cedar oil, and soaking the corpse in a solution of natron for seventy days, which brought away or destroyed the viscera and soft portions, leaving only the skin and bones. The expense was a *mina*, relatively worth about £243. The third process, in use for the poorer classes, washed the corpse in myrrh, and salted it for seventy days. The expense was a trifle, not mentioned. When thus prepared, the bodies were ready for sepulture, but were often kept some time before being buried—often at home—and even produced at festive entertainments, to recall to the guests the transient lot of humanity. When buried, they were sent to the *cholchytæ*, a higher class than the *taricheutæ*, who had charge of the tombs, the mummies, and the masses for the dead. All classes were embalmed, even malefactors; and those who were drowned in the Nile or killed by crocodiles received an embalmment from the city nearest to which the accident occurred. As the art, however, existed for many centuries, it may be easily conceived that mummies were preserved by very different means, and quite distinct from those described by classical authors, some having been found merely dried in the sand; others salted by natron, or boiled in resins and bitumen, with or without the flank incision, having the brains removed through the eyes or base of the cranium, with the viscera returned into the body, placed upon it, or deposited in jars in shapes of the genii of the dead, the skin partially gilded, the flank incision covered with a tin plate, the fingers cased in silver, the eyes removed, and replaced. The mummies are generally wrapped in linen bandages, and placed in costly coffins. See Sarcophagus. The sacred animals were also mummied, but by simpler processes than men. Mummies, it may be observed in passing, were used in the 15th and 16th centuries of the Christian era for drugs and other medical purposes, and nostrums against diseases, and a peculiar brown colour, used as the background of pictures, was obtained from the bitumen. The Ethiopians used similar means to preserve the dead, and the successful nature of embalming may be judged from the numerous mummies in the different museums of Europe. Other less successful means were used by nations of antiquity to embalm. The Persians employed wax; the Assyrians, honey; the Jews embalmed their monarchs with spices, with which the body of our Lord was also anointed; Alexander the Great was preserved in wax and honey, and some Roman bodies have been found thus embalmed. The Guanches, or ancient inhabitants of the Canary Isles, used an elaborate process like the Egyptian; and desiccated bodies, preserved by atmospheric or other circumstances for centuries, have been found in France, Sicily, England, and America, especially in Central America and Peru. The art of embalming was probably never lost in Europe; and De Bils, Ruysch, Swammerdam, and Clauderus boast of great success in the art. There was a celebrated cabinet of M. De Rasière in 1727, containing prepared bodies; and the mode of embalming princes and others, by prepared balms and other substances, is detailed by Pènicher, consisting in the removal and separate embalmment of the heart and viscera, and removing the brain, and introducing the preparations by incisions all over the body. Dr Hunter injected essential oils through the principal arteries into the body. Boudet, during the French Empire, embalmed the bodies of the senators with camphor, balsam of Peru, Jews' pitch, tan and salt; but the discovery of Chaussier of the preservative power of corrosive sublimate, by which animal matter becomes rigid, hard, and grayish, introduced a new means of embalming by Beclard and Larrey; but owing to the desiccation, the features do not retain their shape. The discovery of the preservative power of a mixture of equal parts of acetate and chloride of alumina, or of sulphate of alumina, by Gannal in 1834, and of that of arsenic by Tranchini, and of pyroxilic spirits by Babington and Rees in 1839, and of the antiseptic nature of chloride of zinc, have led to the application of these salts to the embalming or preparation of bodies required to be preserved for a limited time; but there is no reason to believe that bodies so preserved will last as long as Egyptian mummies. See Pettigrew, *History of Mummies* (4to, Lond. 1834); Gannal, *Traité d'Embaumement* (8vo, Paris, 1838), translated by Harlan (8vo, Philadelph. 1840); Magnus, *Das Einbalsimiren der Leichen* (8vo, Braunsch. 1839).

EMBA'NKMENT, EA'RTHWORK. Embankments, in Engineering, are masses of earth, rock, or other materials artificially formed, and rising above the natural surface of the ground. They are chiefly formed either (1) to carry railways, common roads, canals, &c., over depressions of the country; or (2) for hydraulic purposes, such as the formation of reservoirs for storing water; or as defences against the overflowing of rivers, the encroachments of the sea, of lakes, &c.

In the formation of canals, railways, and other roads, embankment and *excavation* go hand in hand, and, under the name of Earthwork, form—especially in modern times, and since the development of the railway system—a vast branch of industry, giving employment to many thousands of labourers, known in England as 'navvies.' The earthworks executed within the last quarter of a century in Great Britain alone have cost many millions of pounds.

In planning works of the kind alluded to, engineers follow, as much as possible, the principle of making the cuttings or excavations and the embankments balance; i. e., of making the earth, &c., taken from the cuttings be sufficient for the formation of the embankments. See Railways (Engineering). In proceeding to the actual construction of a railway embankment, e. g., a beginning is made at the points where the level of the formation meets the surface of the ground; and on each side of these points the cutting is taken out, and the embankment formed by men using pick, shovel, and barrow, so that a roadway is formed for a distance of from 50 to 100 yards. When the 'lead,' or the distance between the face of the cutting and the 'tip-head,' or end of the embankment, is greater than this, it is no longer economical to use the barrow. To continue the cutting and embankment, several methods may be employed; the most common are, dobbin carts; small wagons run upon light rails at a narrow gauge, and drawn by men or horses; ordinary earth-wagons drawn by horses, and occasionally by a locomotive;

and lastly, ballast-wagons or trucks drawn by a locomotive. The cost of earthwork naturally varies greaty with the nature of the strata in which the cutting has to be made, the length of the 'lead,' and other circumstances. When rocks have to be cut through, Blasting (q. v.) is had recourse to. One of the points on which considerable doubt existed, was as to the inclination of the side-slopes of embankments; but it has been found that nearly all kinds of earthwork will stand at an inclination of 1½ horizontal to 1 vertical. When, however, it is necessary to use very wet substances, such as peat-moss or wet clays, or when the embankment is of great height, a flatter slope may be necessary. In many cases, it is advisable to substitute a Viaduct (q. v.) for an embankment. All embankments put in as above mentioned subside more or less, the subsidence being much more distinctly perceptible in clay than in gravel. When clay is thrown by the wagon over a considerable tip, the lower half of the embankment will be seen to consist of round bullets of clay of sufficient hardness to resist being squeezed into one mass by the weight of the embankment, until, in the course of time, from the effects of moisture, they become gradually disintegrated, and a settlement or sinking of the embankment takes place, sometimes to the extent of a twelfth, or even a tenth of the height. The greatest sinking usually occurs during the first wet weather after the formation of the embankment; but it sometimes goes on, though more and more slowly, for years. In the case of railway embankments, this subsidence is seldom of very material importance. If the permanent rails are laid, the labour and expense of restoring them to the level is not great, and the embankment should always be formed sufficiently wide at the top to allow of filling it up to its proper level without adding to the slopes. It is, however, practicable, though rather hazardous, to widen it at the top afterwards by cutting trenches in the slopes.

When the side-slope of the ground on which an embankment is to be formed is very steep, the whole work has a tendency to slip laterally; and to prevent this, trenches or steps are cut in the ground before putting in the embankment. When the material is very wet, it sometimes is impossible to prevent the slopes from bulging out, in which case it is generally sufficient to put in additional stuff until the work stands. Peat-moss is seldom used to form an embankment, but frequently an embankment has to be formed where the ground below is moss to a considerable extent. In this case, many plans have been adopted to form a substantial unyielding work, which, where the moss is deep, and contains much water, is often very troublesome and expensive. Among these, perhaps, in most cases, the best is to continue throwing in earth until no further subsidence takes place. In some cases, piling has been adopted, and in others, a layer of tree-tops and brushwood has been placed on the moss under the embankment. When this is done, it frequently happens that the ground on each side of the embankment opens in great rents, rises to a considerable height, and moves laterally from the embankment. A good example of this may be seen on the Scottish Central Railway, a short distance to the south of the Bridge of Allan station.

Embankments, when finished, have their side-slopes usually covered with soil and sown with grass-seed; this not only improves their appearance, but adds considerably to their stability, preventing rain and wind from doing the damage that might otherwise take place.

In regard to embankments to restrain or prevent the encroachment of water, it is necessary, in addition to forming them of sufficient height and strength, to cover the surface of the slopes in such a way that the action of the water will not affect it. Of course the method adopted must depend entirely on the nature of the case; where, for example, the water only occasionally touches the embankment, as in the case of river-floods, and does not run with great violence along it, good turf pinned to the slopes has been found effectual. Where, however, the slopes are subject to the action of waves or rapid water, more effectual and expensive measures must be adopted, such as stone-pitching, piling, &c. Embankments of this nature are used on a great scale in Holland. See Dykes.

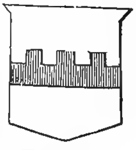
Embankments for damming up water so as to form ponds or reservoirs, require, in addition to the other conditions, to be perfectly water-tight; and for this purpose a 'puddle-wall' of clay is carried from top to bottom in the heart of the structure. The great difficulty lies in preventing the water from finding its way between the bottom of the puddle-wall and the foundation on which it rests, or even through the substances of which that foundation consists; and the wall must often be carried to a great depth below the surface of the ground until an impermeable stratum be found. A knowledge of the geology of the place is here essential to the engineer.

EMBA'RGO (from the Spanish *embargar*, to in-bar, to arrest), is a temporary order from the Admiralty to prevent the arrival or departure of ships. It may apply to vessels and goods, or to specified goods only; it may be general or special; it may apply to the entering only, to the departure only, or to both entering and departure of ships from particular ports; and lastly, although issued by the Admiralty in this country, it would be equally an embargo if issued by any other competent authority. Such embargoes are generally connected in some way or other with a state of war between two countries.

E'MBASSY. In a popular sense, all diplomatic missions are spoken of as embassies; but such is not the technical meaning of the term. In its more limited acceptation, embassy is a mission presided over by an ambassador, as distinguished from a mission or legation intrusted to an envoy, or other inferior diplomatic minister. In this stricter sense, Great Britain has now only four embassies—those at Paris, Vienna, St Petersburg, and Constantinople. The only difference between the powers and privileges of the ambassador and the envoy is, that the former represents the person of his sovereign, and in this capacity he can demand a private audience of the sovereign to whom he is accredited; whilst the latter must address himself to the minister for foreign affairs. A residence is provided for the ambassador, and an allowance for house-rent is made to inferior ministers, in addition to their salaries. See Ambassador, Envoy, Consul.

EMBATE'RION, a war-song of the Spartans, accompanied by flutes, which they sung marching in time, and rushing on the enemy. The origin of the embaterion is lost in antiquity.

EMBA'TTLED, or **IMBATTLED**, called also *Crenellé*, one of the partition lines in heraldry, traced in the form of the battlements of a castle or tower. A bordure embattled is often given as a difference to any member of a family who is, or has been, a soldier.



Embattled.

EMBA'TTLEMENT. See Battlement.

E'MBER or **EMBERING DAYS.** According to the *Book of Common Prayer* of the Church of England, three days are appointed four times in the year to be observed as days of fasting and abstinence; these days are the Wednesday, Friday, and Saturday after the first Sunday in Lent, after the feast of Pentecost, after the 14th September, and after the 13th December. The term 'embering' has been variously derived from the Greek *ημεραι*, and from the embers or ashes which in the earliest times were strewed over the head at times of fasting, in token of humility and self-condemnation. But the more correct derivation would appear to be from the Saxon *Ymbrine dagas*, from the Saxon *ymb*, about, and *ryne*, a course or running, the term applied to these fasts because they came round at certain set seasons in the year.—Somner, *Dictionarium Saxonici*. This phrase is used in the laws of Alfred the Great, and also of Canute, and corresponds with the term used by the canonists, *jejunia quatuor temporum*, the fasts of the four seasons. Mr Somner says that the embering days were 'times of old chosen and set apart for fasting and prayer for obteyning the fruits of the earth, and to give thanks for the same, whereas at those times they are either sowen, sprung up, coming in their ripenesse, or gathered into the barne, as also to obtaine the grace of the Holy Ghost, when holy orders are given and ministers made.' It is to this latter purpose that the Church of England in the present day particularly devotes the ember days, and a special prayer is appointed for use at those seasons.

EMBERI'ZA and **EMBERIZIDÆ.** See Bunting.

EMBE'ZZLEMENT, the felonious appropriation by clerks, servants, or others in a position of trust, of goods, money, or other chattels intrusted to their care, or received in the course of their duty, on account of their employers. It is essential to the crime of embezzlement that the article taken should not have been in the actual or constructive possession of the employer; for if it were, the offence would amount to Larceny (q. v.). Embezzlement is not an offence at common law; hence, persons guilty of this crime were formerly suffered to escape punishment. In consequence of a flagrant instance of this immunity (Bazeley's Case, ii. Leach, 835), the Act 39 Geo. III. c. 85, was passed, whereby embezzlement was made a felony. This act has been repealed, but the law has since been fixed by subsequent enactments. The leading statute on this subject is 7 and 8 Geo. IV. c. 29.

Embezzlement by clerks or servants is punishable by transportation or imprisonment. See Punishment. If the offender be a male, he is liable to be once, twice, or thrice publicly or privately whipped, at the discretion of the judge. Questions of much nicety often arose as to whether the facts proved constituted the crime of embezzlement or that of larceny; but this distinction has ceased to be of any importance since the passing of the Criminal Justice Act (14 and 15 Vict. c. 100), whereby it is made competent, on an indictment for embezzlement, to convict a man of larceny, and *vice versâ*. But it has been decided in a recent case, R. *v.* Gorbutt, 26 *Law Journ.*, M. C. 47, that on an indictment for larceny, it is not competent to convict of larceny where the facts amount only to embezzlement.

Embezzlement by bankers, brokers, factors, and other agents, is regulated by the above statute, sect. 49, and also by the Fraudulent Trustees Act (20 and 21 Vict. c. 54). These most important statutes have rendered almost every conceivable species of fraudulent misappropriation by bankers and others a punishable offence. In particular, by the latter statute, embezzlement by a Bailee (see Bailment) is now indictable. Under this provision, a shopkeeper appropriating goods intrusted for repair, may be tried and convicted.

Embezzlement by bankrupts of any part of their estate, or of any books, &c., relating to the same, with intent to defraud their creditors, is, by 12 and 13 Vict. c. 106, made punishable by transportation for life. See Bankrupt.

Embezzlement of letters and newspapers by servants of the Post-office, is also made highly penal by 7 Will. IV. and 1 Vict. c. 36. The embezzlement of newspapers is punishable by fine or imprisonment; but to embezzle a letter, subjects the offender in all cases to transportation for seven years; and if the letter contain money or valuables, to transportation for life.

Embezzlement of the Queen's stores is punishable by transportation for life (4 Geo. IV. c. 53). In regard to this species of embezzlement, summary authority is granted to comptrollers and other officers named, on proof of embezzlement of government stores below the value of twenty shillings, to fine the offenders to the amount of double the value of the article taken.

In Scotland, the crime of embezzlement, or breach of trust, is punishable at common law. The distinction between this crime and that of theft is substantially the same as between embezzlement and larceny in England. In both countries, the criterion relied upon to distinguish these crimes is the question of possession by the owner; but in Scotland the tendency of the decisions of late years has been to regard the appropriation of articles intrusted for a temporary purpose as amounting to theft. In this respect, the law of Scotland differs from that of England in regard to embezzlement by a bailee. In Scotland, the appropriation of things found without an owner would appear, according to Mr Hume, not to be an indictable offence. Such a case would unquestionably be treated in England as Larceny (q. v.).

E'MBLEM, a representation of an object intended to signify or indicate to the understanding something else than that which it directly represents to the eye. The meaning of the emblem rests upon its secondary, not its primary signification. Emblem is often used in a sense synonymous with Symbol, under which, as the wider word, it will be more convenient to treat it.

EMBLE'MATA (Gr.), the works of art with which gold and silver vessels were decorated by the ancients. These sculptured figures were generally executed either in the precious metals or in amber. They were called crustæ by the Romans, though the Greek word was also used.

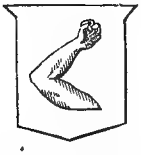
E'MBLEMENTS (Fr. *emblaver*, to sow with *blé* or wheat), growing crops of cereal and vegetable productions raised by the labour of the cultivator. Fruits of trees growing on the land, and grass, are not emblements. The law has ever been mindful of the interests of the tenant who has expended his toil and capital in tilling the ground. By the feudal law, when a tenant for life died between March and August, his heirs were entitled to the profits for the whole year. By the existing law of England, a tenant for life, or other tenant, whose term may be suddenly and unexpectedly brought to a close, is entitled to reap the crop which he has sown, and to enter the lands after expiry of the term to remove the emblements. By 14 and 15 Vict. c. 25, a tenant at Rack-rent (q. v.) under tenant for life is entitled, where the tenancy determines by death of tenant for life, to hold the land till the expiry of the current year. But if a term be brought to an end by the act of the tenant, he is not entitled to emblements. Thus, a tenant for life who commits forfeiture, or a widow entitled to dower—who, as regards dower-lands, is considered tenant for life—marrying again, are not entitled to emblements. On the death of a tenant, the executor, and not the heir, is entitled to the emblements. By 11 Geo. II. c. 19, emblements may be distrained for rent, and by common law they may be taken in execution. The right of life-renters in Scotland to reap the growing crop is somewhat similar to the English right to emblements. See LIFE-RENTER.

E'MBLICA, a genus of plants of the natural order *Euphorbiaceæ*, having a fleshy fruit. *E. officinalis* is a tree found in most parts of India, with a crooked stem, thinly scattered spreading branches, long narrow leaves, minute greenish flowers, and a globular fruit about the size of a gall-nut. The fruit is very acid, and somewhat astringent, which qualities it retains when dry and shrivelled. It is used in India as a deobstruent and febrifuge, also for tanning leather, and making ink, and is generally called *Emblic Myrobalans.*

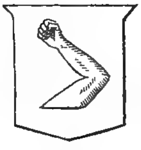
EMBO'SSING, the art of producing raised figures upon various substances, such as paper, leather, wood, metals, &c. This is usually effected by pressing the substance into a die, the kind of die and mode of applying the pressure being modified according to the nature of the design and the properties of the substance to be embossed. Sheet-metal is embossed by stamping it between a pair of steel dies, one in relief, the other in intaglio. See DIE-SINKING. When the pattern is a deep one, several pair of dies are used, and several blows given with each, the metal being occasionally annealed. The first stamping produces a crude resemblance to the final design, of moderate depth; successive stampings bringing up more of the details, and giving increased depth. The upper die is usually raised by a rope attached over a pulley to a stirrup, in which the workman places his foot; he draws his foot down to raise the heavy die to the required height, and then suddenly releases the pressure of his foot from the stirrup, when the die descends by its own weight. While thus raising the die with his foot, he adjusts the work in its place with his hands. Smaller work is embossed with a screw-press, the lever of which is turned with one hand, while the work is placed under the dies and removed by the other. Paper and card are embossed in a similar manner, but the dies are frequently of brass, sometimes of copper electro-deposits, suitably backed. The counter-die is commonly made of soft metal, card or mill board, pressed into the metal intaglio die until a sharp impression is produced. The paper or card is well damped, and a fly-press is generally used. The leather or cloth for book-binding is embossed in this manner, the counter-die being usually made by gluing several pieces of millboard together, and gluing them to the upper bed of the press, then stamping these into the lower die until a perfect impression is obtained. The embossing press designed and constructed by Mr Edwin Hill, for impressing the medallion upon postage envelopes, is a very elaborate and beautiful machine, which inks the die itself, and with the aid of two boys, to place and remove the envelopes, embosses sixty envelopes in a minute. When large surfaces of textile fabrics, such as table-covers, &c., have to be embossed, the fabric is compressed between rollers, one being of metal, upon which the device is sunk like a die; the counter-roller or bed-cylinder is of paper covered with felt; this yields sufficiently to allow the fabric to be pressed into the die-cylinder. A third smooth metal roller is commonly used to press out again the impression made upon the bed-cylinder; this acts upon the bed-cylinder on the side from which the fabric emerges. Paper is sometimes embossed in this manner; and the flatting roller may be dispensed with if the cylinders are sufficiently accurate in their diameters for the pattern always to fall on the same place at each successive revolution. Leather embossed in high relief has been used for ornamental purposes in place of wood-carving on picture-frames, cabinet-work, &c. The dies are of type-metal or electro-deposits, and the leather is softened or fulled, i. e., worked with water till it contracts and thickens, then it is pressed into the dies by suitable round pointed tools, like modelling tools, made of wood, bone, or copper. When dry, the leather is removed from the moulds, and by its elasticity and shrinking it will relieve from very deep and undercut designs.—Mr Straker's mode of embossing wood differs from all the above, and is very curious and ingenious. When wood is pressed and rubbed with a blunt instrument, the surface yields, and a depression of some depth may be made in it; if the wood be now soaked in water, the depressed portion will rise again to its original level. Mr Straker takes advantage of this property thus. He rubs down the surface in those parts that are to be finally in relief, he then planes or shaves away the uncompressed portions until the bottom of the depressions are reached and made level with the new surface; the wood is then soaked; the compressed parts rise to their original level, and, of course, in doing so, rise above the portions that have been planed away, and present the required device in relief.

EMBOUCHURE (Fr.), that part of a wind instrument to which the lips are applied to produce the sound.—The term EMBOUCHURE is also applied to the mouth of a river.

EMBOW'ED, the heraldic term for anything which is bent like a bow. The illustration represents a sinister arm couped at the shoulder, embowed. When the arm is turned the reverse way, it is said to be counter-embowed.



Counter-embowed.



Embowed.

EMBRA'CERY, in the law of England, the offence of influencing jurors by corrupt means to deliver a partial verdict. This offence is a species of Maintenance (q. v.). The giving of money to be distributed amongst jurors is embracery, though the money be not actually distributed. Not only persons attempting to influence the jury, but jurors themselves attempting unduly to bias the minds of their fellows, are guilty of embracery. The using indirect means in order to be sworn on a jury, is also embracery. This offence is punishable by various old statutes. At present, the crime is punishable by 6 Geo. IV. c. 50, which enacts, that every person guilty of embracery, and the jury consenting thereto, shall be punished by fine and imprisonment.

EMBRA'SURES, in Fortification, are openings in the parapets, flanks of bastions, and other parts of the defence-works, through which cannon are pointed. The siege-batteries of the enemy have also embrasures. Their use is, to shield as much as possible the guns, gun-carriages, gunners, and interior of the place, and yet leave spaces for the free firing of the guns. Each opening slopes outwards, so as to give a greater sweep to the gun's action.

EMBROCA'TION (Gr. *em*, into, and *brechō*, I wet), the same as Liniment (q. v.).

EMBROI'DERY, the art of producing ornamental needlework-patterns upon fabrics of any kind. This art is coeval with the earliest and rudest manufacture of hair and woollen fabrics. It was one of the most important of the early arts in Oriental countries, where it is still practised with great skill and diligence. It is common among most savage tribes that wear any kind of clothing. The blanket-wrapper of the Red Indian is commonly ornamented with embroidery; the Laplander embroiders upon the reindeer skin that forms his clothes patterns worked with needles of reindeer bone, and thread of reindeer sinews and strips of hide. It is practised as a domestic art in our own country by all classes, from the princess down to the pauper school-girl, and is carried on in large manufactories by very elaborate machinery.

The Chinese are perhaps the most laborious and elaborate hand-embroiderers of modern times; their best work is upon silk. The figures are either in coloured silk alone, or in silk combined with gold and silver thread; the figures of men, horses, dragons, &c., being outlined with gold cord, and filled up coloured and shaded with silk. The Persians, Turks, and Hindus also still excel in embroidery; they use, besides silk and gold and silver thread, beads, spangles, pearls, and precious stones. The dress-slippers of Turkish women of all ranks are elaborately embroidered, usually with a precious stone or a glass bead in the middle of the toe-part of the slipper, and a radiating pattern in gold, silver, or brass wire and silk surrounding it. The Turkey carpet is a sort of embroidered fabric. See CARPET MANUFACTURE.

Some of the Oriental and Indian embroiderers include in their work a great variety of materials besides those above mentioned; feathers are largely and very tastefully used; the skins of insects; the nails, claws, and teeth of various animals; nuts, pieces of fir, skins of serpents, &c., are among these. Coins, which are so commonly used as ornaments for the hair of unmarried women in the East, are sometimes also worked into their dresses with the embroidery. This is especially the case with the Turks and Georgians. The Indian women embroider with their own hair and that of animals.

Tapestry is a kind of embroidery, formerly done with the needle, but now chiefly with the shuttle. This kind of work is, in fact, intermediate between embroidery and weaving, and it is somewhat difficult to determine under which it should be classed, but in accordance with the definition given above, we shall only include needlework under embroidery, and tapestry will be separately treated.

For hand-embroidery, the fabric is usually stretched upon a frame, and the design to be worked is drawn upon it, or some other contrivance is used to guide the worker. If the fabric is sufficiently thin and open, a coloured drawing or engraving may be placed behind the work, and followed with the needle. A sheet of thin transparent paper, with lines upon it corresponding to the threads of the canvas to be worked upon, is sometimes used; this is secured by gum or wax to the drawing; and the design is copied by observing the number of small squares occupied by each colour, and filling in the corresponding meshes of the canvas. *Berlin-work*, which is a kind of embroidery, is done in a similar manner, the pattern being an engraving on which the lines corresponding to the thread are printed, and the meshes filled up with the required colours, painted in by hand by women and children, who copy it from the original design of the artist. The name has been given from the fact, that the best patterns have, since 1810, been published by Wittich, a printseller of Berlin.

In France, pricked patterns are sometimes used, one for each colour, and coloured powders are dusted through the holes upon the fabric to be worked.

All these devices render the art of embroidery a mere mechanical operation, requiring no further artistic skill or taste than is exercised in knitting stockings; but when the embroidress draws the design in outline upon the fabric, and works in the colours with her needle under the guidance of her own taste, embroidery becomes an art that might rank with water-colour drawing or oil-painting; and it is to be regretted that so much time should be devoted by ladies to the mechanical, and so little effort made in the direction of truly artistic embroidery.

Muslin-embroidery has been very fashionable of late. This is purely mechanical work. The muslin is printed with a pattern made up of holes of different dimensions; these are cut or punched out, and their edges sewn up with a 'button-hole stitch.' This kind of work is much used as trimming for ladies' clothing, for collars, and children's clothes.

Machine-embroidery has been practised with considerable success during the last quarter century. A machine was exhibited in the French Industrial Exhibition of 1854, by M. Heilmann of Mulhausen, by which one person could guide from 80 to 140 needles, all working at the same time, and producing so many repetitions of the same design. Although the details of the construction of this machine are rather complex, the principle of its action may be easily understood. The needles have their eyes in the middle, and are pointed at each end, so that they may pass through from one side of the work to the other without being turned. Each needle is worked by two pair of artificial fingers or pincers, one on each side of the work; they grasp and push the needle through from one side to the other. A carriage or frame connected with each series of fingers does the work of the arm, by carrying the fingers to a distance corresponding to the whole length of the thread, as soon as the needle has passed completely through the work. The frame then returns to exactly its original place, and the needles are again passed through to the opposite set of fingers, which act in like manner. If the work were to remain stationary, the needles would thus pass merely backwards and forwards through the same hole, and make no stitch; but by moving the work as this action proceeds, stitches will be made, their length and direction varying with the velocity and the direction in which the work moves. If 140 needles were working, and the fabric were moved in a straight line, 140 rows of stitching would be made; if the work made a circular movement, 140 circles would be embroidered; and so on. In order, then, to produce repetitions of any given design, it is only necessary to move the fabric in directions corresponding to the lines of the design. This is done by connecting the frame on which the work is fixed to an apparatus similar to a common pantagraph, or instrument so constructed that one end repeats on a smaller scale exactly the movements which are given to the other. See PANTAGRAPH.

The free end of this is moved over an enlarged copy of the design, the movement being a succession of steps, made after each set of needles has passed through; and thus the work is moved into the position required to receive the next stitch of the pattern.

This machine was subsequently patented in England, and many improvements have been made upon its details, but the principle of its construction remains the same.

Although it is *possible* to embroider any design with such machines, there are only certain designs that can be worked economically; for to do this, the patterns must be so designed as to consume each needleful of silk without waste. The length of silk required for each colour can be calculated with extreme accuracy, and the designer is usually limited by this requirement. A greater range is, however, obtainable by dyeing the same thread of silk in different colours, the length of each colour corresponding to what is required for producing the pattern; but a large demand for each pattern is required to render this profitable.

EMBRUN, a town of France, in the department of Hautes Alpes, is situated on a platform of rock in the midst of a plain, on the right bank of the Durance, 20 miles east of Gap. Seen from a distance, the town has an imposing appearance. The streets of E. are narrow, dirty, and irregular. It is surrounded by loopholed ramparts and ditches, and strengthened by bastions. The principal buildings are the cathedral, a Gothic edifice, surmounted by a lofty Romanesque tower, and the barrack, formerly the archbishop's palace. E. manufactures broadcloth, counterpanes, hats, cotton-yarn, and leather. Pop. 4736.

E. occupies the site of the ancient Ebrodunum, capital of the Caturiges, and an important Roman station. The line of its archbishops can, it is said, be traced to the time of Constantine. In modern times E. has been thrice destroyed by fire: by the Moors in 966, during the religious wars in 1573, and by the Duke of Savoy in 1692.

E'MBRYO (Gr.), an organised being in a rudimentary condition, or the rudiment from which, under favourable circumstances, an organised body is to be developed. In botany, the term embryo is applied to the germ formed within the ovule on fertilisation, and which increases to become the principal part of the seed. The albumen or perisperm of the seed, being regarded as a mere store of nourishment for the embryo, is not accounted part of the embryo; the cotyledons, however—although a large store of nourishment is often laid up in them—are considered as essentially belonging to it, along with the *plumule*, the *radicle*, and the connecting parts. As to animals, the term embryo is used as equivalent with *fœtus*, and as designating the rudimentary animal from the moment of impregnation until the egg is hatched; but although this takes place at very different stages of development in different kinds of animals, and consequent metamorphoses are undergone by some before they reach their perfect state, the term embryo is not applied to the *larvæ* and *pupæ* of insects, or to the analogous states of other classes of animals. Eggs contain, along with the embryo, a store of nourishment for it in the earlier stages of its development. See Reproduction, Development, Egg, Fœtus, Ovule, Seed, and Spore.

EMBRYO'LOGY. See Development of the Embryo.

EMBRYO'TOMY, a division of the fœtus into fragments, to extract it by piecemeal, when the narrowness of the pelvis or other faulty conformation opposes delivery.

E'MDEN, a fortified town of Hanover, in the province of East Friesland, is situated a little below the embouchure of the Ems into Dollart Bay, in lat. 53° 22′ N., long. 7° 13′ E. It lies low, but is protected by strong dykes from any inroad of the waters of the bay. Nevertheless, occasional inundations take place; as in 1826, when the water stood up to the first floor of the houses for three months. E., which is the chief commercial town of Hanover, is surrounded by walls and towers, is well built, has spacious and well paved streets, and houses remarkable for their appearance of comfort, and for their extreme cleanliness. It is intersected by numerous canals, which are crossed by about thirty bridges. The Delf Canal runs south from the town to Dollart Bay, a distance of about two miles, but it can be entered at high water only, and even then is not navigable for vessels of more than 13 or 14 feet draught; all vessels of greater draught being obliged to unload in the roadstead of Delf, at the mouth of the canal. The principal building, and one of the finest public edifices in East Friesland, is the town-hall, containing a library and a curious collection of ancient arms and armour. E. stands in a district of great fertility. It has a good deal of ship-building, besides various other manufactures. From this town, from 50 to 60 ships are sent out to the herring-fishing off Scotland. E. was made a free port in 1751, came into the possession of Holland in 1808, and, with the whole of East Friesland, was incorporated with the kingdom of Hanover in 1815. Pop. about 12,500.

E'MERALD (Sp. *esmeralda*, Fr. *émeraude*, Ger. *smaragd*, Gr. *smaragdos;* the name is originally Semitic, or at least eastern, but the signification unknown), a mineral generally regarded by mineralogists as merely another variety of the same species with the Beryl (q. v.), with which it essentially agrees in composition, crystallisation, &c., differing in almost nothing but colour. The E., which, as a gem, is very highly valued, owes its value chiefly to its extremely beautiful velvety green colour. It is composed of about 67—68 per cent. of silica, 15—18 of alumina, 12—14 of glucina, and a very little peroxide of iron, lime, and oxide of chromium. Its colour is ascribed chiefly to the oxide of chromium which it contains. Its specific gravity is 2·577—2·725. In hardness it is rather inferior to topaz. The localities in which E. is found are very few. The finest have long been brought from South America, where they are obtained from veins traversing clay-slate, hornblende slate, and granite, in a valley not far from Santa Fé de Bogota. Emeralds of inferior quality are found in Europe, imbedded in mica-slate in the Henbach Valley in Salzburg. They are also found in the Ural; and some old mines in Upper Egypt have also been discovered to yield them, from which, probably, the ancients obtained them. This gem, known from very early times, was highly prized by the ancients. Pliny states that when Lucullus landed at Alexandria, Ptolemy offered him an E. set in gold, with his portrait engraven on it. Many wrought emeralds have been found in the ruins of Thebes. Nero, who was near-sighted, looked at the combats of gladiators through an eye-glass of E., and concave eye-glasses of E. seem to have been particularly esteemed among the ancients. As a precious stone, the E. is rarely without flaw. Its value also depends much on its colour. A very perfect E. of six carats has been sold for £1000.

It appears not improbable that emeralds have been found in the East, in localities not at present known, but the name E. or Oriental E. is often given to a very rare, beautiful, and precious green variety of Sapphire (q. v.).

E. Copper is a beautiful and very rare E. green crystallised mineral, also called Dioptase, found only in the Kirghis Steppe, and composed of about 39 parts silica, 50 protoxide of copper, and 11 water.

EME'RSION, the reappearance of one heavenly body from behind another, after an eclipse or occultation. The immersions and emersions of Jupiter's first satellite are particularly useful for finding the longitude of places. Minutes or scruples of emersion are the arc of the moon's orbit passed over by her centre, from the time she begins to emerge from the earth's shadow to the end of the eclipse.

E'MERSON, Ralph Waldo, the most celebrated of American philosophers, was born at Boston, United States, May 25, 1803, entered Harvard University in 1817, graduated in 1821, and became pastor of a Unitarian congregation in Boston in 1829. This office, however, he resigned in 1832, on account of the gradually increasing differences between his own modes of thought and those of his hearers. The next year he spent in England. Since then, he has led a quiet, retired, meditative life, chiefly at Concord. Among the earliest noticeable productions of his pen were two lectures, or orations, entitled *Nature and Man Thinking*, delivered before the Phi Beta Kappa Society at Cambridge, United States, in 1837. In the following year appeared his *Literary Ethics, an Oration;* and in 1841, *The Method of Nature, Man the Reformer*, the first series of his *Essays*, and several lectures, &c. Three years later, he issued a second series of *Essays*. In 1846, he published a volume of poems. In 1849, he revisited England, to deliver a series of lectures on *Representative Men*. When published, they were generally reckoned the most vigorous and intelligible of all the author had then written. In 1852, in conjunction with W. H. Channing and J. F. Clarke, he published the Memoirs of Margaret Fuller (q. v.), Marchesa d'Ossoli. *English Traits* appeared in 1856, and the *Conduct of Life* in 1860. There is perhaps no living writer of note regarding whom opinions are so divided as Emerson. Some critics have not hesitated to place him among the profoundest thinkers belonging to the present age, while others, equally confident, have pronounced him to be in the main a sciolist and charlatan. Both of these opinions, but especially the latter, may be dismissed as absurd. No man who is himself sincere, will doubt the sincerity of the American philosopher. His entire 'conduct of life' would be otherwise inexplicable. It is true, however, that the subtlety of his intellect, which is far more wonderful than either its breadth or depth, often deceives him by the facility with which it discovers divine meanings in nature and the human soul. E. never pauses to harmonise his thoughts and convictions; and, it must be admitted, has rather a theatrical *penchant* for paradox. He knows that an idea is more forcible and attractive, and can be clothed in more brilliant and picturesque phraseology when it is not qualified, and, as it were, dragged down from its elevation by the influence of other ideas. He loves to watch the play of thought, and to dream and muse about it, borne up on the wing of a pure and delicate imagination, rather than to weigh its significance, or to build it up into an 'intellectual system' or a creed. E. thus belongs to the class of minds which are intuitional rather than reflective, and subtle rather than sagacious. His thinking charms, animates, and vividly excites the mental faculty of his reader, but it does not satisfy or settle any question conclusively. Hence his speculations on religion, philosophy, literature, and life, though stimulating to the young, are coldly regarded by men of mature and sage understanding. E. has nowhere formally defined the fundamental basis of his speculation. He appears to be what is called a Pantheist, at least he rejects entirely that kind of Theism which separates God from nature, and which looks upon him as simply a living Spiritual Personality. He will not recognise a God who is not 'one with the blowing clover and the falling rain.' In regard to man and his destinies, he entertains exalted hopes; but religion is not in his eyes a divinely revealed (in the ordinary sense) or infallible thing; all creeds are merely 'the necessary and structural action of the human mind' in the course of its historical progress. Man made them all (Christianity included), and he believes, that from the inexhaustible depths of our nature there will come forth in due time new and ever higher faiths, which will supersede those that have gone before. E. is often said to have derived a good deal of his thinking from Thomas Carlyle. This is true, but not in any sense that can justify the vulgar criticism which makes him out to be a 'Yankee pocket-edition of Carlyle.' He is essentially an original and independent genius. Some of his writings have been translated into French, and have excited considerable admiration among the Parisian transcendentalists. See Montégut's *Essais de Philosophie Américaine* (1851).

E'MERY (Fr. *émeril*, Ger. *schmergel*, Gr. *smiris;* allied to *smear*), a variety of Corundum (q. v.), or of the same mineral species of which corundum and sapphire (with oriental ruby, &c.) are also varieties. It agrees with them very perfectly in composition, hardness, and specific gravity; but is dull, opaque, and not crystallised, sometimes of a grayish black, and sometimes of a blue colour. It occurs both massive and disseminated. Its masses, although very compact, have a somewhat granular structure. It is found in several parts of Europe, in Asia Minor, Greenland, &c., generally in masses scattered through aqueous deposits, but in one locality in Saxony in beds of steatite in a schistose rock. The E. of commerce is chiefly obtained from the island of Naxos. Being very hard, it is much used for grinding glass and polishing metals and other hard substances. It is found in lumps, having a granular structure. It is composed of alumina, oxide of iron, and silica, with a little lime, in proportions varying considerably with different specimens. The following may be taken as an average: alumina, 82; oxide of iron, 10; silica, 6; lime, $1\frac{1}{2}$.

It is prepared for use by first breaking it into lumps about the size of a hen's egg, then crushing these to powder by stampers. It is then sifted to various degrees of fineness, which are numbered according to the meshes of the sieve. Plate-glass manufacturers and others separate E. powder into different degrees of fineness by the method of *elutriation* (q. v.). A number of copper cylinders of graduated capacities are placed in a row, and filled with water; the E., churned up with an abundance of water, is admitted by a pipe into the smallest, it then passes to the next in size, and finally flows from the largest; and thus, as a given quantity of water with E. suspended in it, passes in equal times through vessels of varying capacities, the amount of agitation will obviously be greatest in the smallest vessel, least in the largest, and in like proportion with the intermediate; the largest particles, therefore, sink in the smaller vessel, and so on till only the very finest will reach the largest vessel. In this manner, any number of gradations of fineness may be obtained, according to the number and sizes of the vessels. Elutriation in oil or gum-water is sometimes used on a smaller scale, the E. being stirred up in the liquid, and portions poured off at different intervals of time, the finest being, of course, the last to settle. The use of the oil or gum is to make the subsidence take place more slowly.

E. thus prepared is used for a great many important purposes in the arts. Being next in hardness to diamond-dust and crystalline corundum, the lapidary uses it for cutting and polishing many kinds of stone. Glass-stoppers of all kinds are ground into their fittings with it. Plate-glass is ground flat by its means; it is also used in glass-cutting, and in grinding some kinds of metallic fittings. When employed for the polishing of metals, it has to be spread on some kind of surface to form a sort of fine file. *E. paper*, *E. cloth*, *E. sticks*, *E. cake*, and *E. stone*, are various contrivances for such purposes.

E. paper is made by sifting E. over paper which has been covered with a coating of glue. It is used either by wrapping it round a fine file, or a stick, or in the hand, according to the form of the work. See POLISHING OF METALS.

E. cloth is made like E. paper, with coarse calico substituted for the paper. The E. does not adhere so well as to paper, and it is therefore not used by metal-workers, who work E. paper till smooth with wear, but is chiefly used for purposes where the hand alone is used, and paper would tear.

E. sticks are used for the same purposes as E. paper wrapped round files; they are made of deal sticks shaped like files, then glued over, and dipped once or twice in a heap of emery.

E. cake is a compound of bees-wax, suet, and E., melted and well worked together. It is applied to buffing wheels, &c.

E. stone is a kind of earthen-ware mixed with E., formed by pressing a mixture of clay and E. into suitable moulds, and then firing, like common earthen-ware. It is moulded into wheels, laps, &c. Its hardness and cutting power are very considerable.

EMESA. See HEMS, or HOMS.

EME'TICS, medicines given for the purpose of producing Vomiting (q. v.). They are given when it is desirable to relieve the stomach of some noxious or indigestible substance, as a narcotic poison, or excess of food, or some special article of diet which has disagreed. Emetics are also administered in cases of fever, where the copious secretion they produce from the glands of the stomach and intestines is supposed to have a directly curative effect, aided, perhaps, by the sedative action of emetics upon the circulation and nervous system. There is a considerable amount of evidence to shew, that emetics have the power of cutting short typhus and other fevers in the earliest stage, and afterwards of making the attack of the disease less severe. In diseases of the respiratory organs, emetics are given as the quickest and safest method of removing accumulated mucus from the air-passages; and in Croup (q. v.), their action is especially favourable, being often followed by expectoration and a rapid improvement in the suffocative symptoms. Emetics are to be given with great caution, however, in all very depressed states of the system, as their primary action is to produce Nausea (q. v.), which is attended always with more or less diminution of the vital power, and often with great depression of the heart's action, amounting to syncope or fainting. The principal emetics are the preparations of antimony, zinc, and copper; ipecacuanha in powder or in wine; squill, lobelia, and, generally speaking, the whole class of expectorants and irritants; the latter of which, however, with the exception of sulphate of zinc, and perhaps mustard and water, form a dangerous kind of emetics, which should never be administered when the milder kinds can be procured.

EMETINE. See IPECACUANHA.

EMIGRA'TION is the passing from one part of the world to another for the purpose of permanently settling in it. People going thus from one district of the same state to another—especially if it be a distant part, with different habits and physical peculiarities—are sometimes said to emigrate, and in this way the term has been often applied to the English and Scotch settlers in Ireland. In its established signification, however, the word now refers to those who leave the state or dominions in which they have heretofore lived, and in this sense the term applies to those going to the colonies, though these are like the United Kingdom, under the authority of the British crown. In the country which people leave, they are called emigrants or wanderers out—in that in which they settle, they are usually called immigrants. Jacob and his family were immigrants to Egypt, and their descendants became emigrants from that country when they went to inherit the promised land.

The Greeks were addicted to emigration, owing, it has been said, to the many political contests which drove the weaker party from home. Greek emigrants planted colonies on the borders of the Mediterranean and the Black Sea, carrying them as far northward as France, where they established the city of Marseille. The Romans were great colonisers, but by conquest rather than emigration. They disliked leaving Italy; and the military and civil officers necessary to rule a colony were generally the only Romans who abode in it. These even did not, in general, settle in the colonies with their families, but were recalled after a certain period of service, the whole arrangement much resembling that for the government of British India.

The migrations of the northern tribes who overran the Roman empire, are well known in history; their wanderings may be said, indeed, to have continued down to the 13th century. Those who wandered from the north into France, where they acquired great territories, became known as Normans, and were remarkable for entirely throwing off the language and manners, and even all the traditions of their original homes, and becoming the most civilised and courtly portion of the French people. But though thus changed, they still continued to wander, spreading over Britain, Sicily, and the intervening portions of Europe.

The discovery of America opened a vast new field for emigration, which was taken immediate advantage of by the Spanish and Portuguese, and later, by the British, the French, the Germans, and the Dutch. In the 17th c., many of the English Puritans, persecuted in, or discontented with, their own country, found it more congenial to their tastes to live together in a new country, where they would be free from the presence of those who did not sympathise with them, and they thus founded the New England colonies. It is singular that, in the 19th c., an attempt should be made to revive the plan of emigrating for the purpose of maintaining an exclusive church, as, for instance, in the English High Church colony of Canterbury, and the Scotch Free Church colony of Otago.

The emigration fields at the present day are the territory still called the United States of America, the British colonies in America, and the colonies in

South Africa, Australia, and New Zealand. There is a great distinction to be taken between colonies fit for emigration and those dependencies of the British crown held for other purposes. India, for instance, the greatest dependency of the crown, is totally unsuited for emigration. The British people who go there, with the exception of a few merchants, go to form the civil and military staff which rules the country. They stay there no longer than they can help, and instead of living on from generation to generation, send home their children in early youth, families of British origin having a tendency to degenerate, both physically and mentally, by long residence there. It is useless for working-people to go there, as every kind of work is done in some way or other by the natives much cheaper than it could be by Europeans, and the same may be said of every colony in the hot latitudes.

As a question in political economy, opinions about emigration have oscillated violently. At one time it has been prohibited, at another encouraged by all kinds of tempting offers held out to emigrants, while teachers of political economy have proclaimed that there can never be too much emigration. The conclusion to which we are coming in this, as in so many other questions in political economy is, that what is good for the individual members of a community is good for the community collectively—if people can improve their condition by emigrating, it is as well that they should emigrate; but if otherwise, they had better stay at home. It might seem unnecessary to promulgate a doctrine which every man's self-interest should teach him, but unfortunately emigration is one of the matters on which the populace have been liable to delusions which have produced great mischief. Sometimes poor workmen have crowded in where labour was superabundant and capital deficient; at others, men have taken their capital to districts where there was no employment for it, and the unnaturally high price of the necessaries of life has immediately absorbed it all. Young gentlemen, with nothing but showy accomplishments, have gone to the backwoods of America, where they could only prosper by ceaseless toil in felling and clearing. Ambitious, discontented artisans have wandered to the wide pastures of Australia, where they could only get a scanty subsistence as hut-keepers or assistant shepherds, not having skill enough to be intrusted with the charge of stock. Such mistakes have originated from people's ignorance of the fate of those who have gone before, it being generally taken for granted that the emigrant has gone away for his benefit, whereas it has often been for his ruin, and to meet an untimely death.

The standard difficulty is the want of adjustment of capital to labour. This is enhanced by the circumstance, that those who wish to emigrate are generally persons feeling the pressure of poverty at home. The man, however, who goes to a place where there is no capital to employ him with—either his own or some other person's—is just in the position of a shipwrecked mariner cast on the shore. It has been justly remarked, that perfect emigration should consist of a transplantation of home-society with all its several classes and institutions, including capitalists employing labour, artisans of various kinds, members of the learned professions, teachers, and clergymen. An ingenious plan for bringing about such a distribution was called the Wakefield system of emigration, after the name of its inventor. The foundation of the plan was a high charge for land—£1 per acre, the money so advanced by capitalists being employed in exporting labour. The plan failed, however, because people could get land in the United States for a quarter of the price; and even in Australia, where it prevailed, capitalists, instead of buying land, 'squatted,' as it was termed, and the government had to countenance the system, by charging them a small rent or squatting licence.

There was one shape, however, in which it was found necessary for the government to interfere—the protection of emigrants, so far as possible, from cruelty and imposition. Conducting emigration is a trade in which a large body of men are engaged. Before he leaves his own country, the intending emigrant, through means of agents who take up that line of business, can not only be shipped for a distant port, but can contract for his removal inland to his final place of settlement, and can even contract for the purchase of a plot of ground, or for the sale of his labour. The temptations and the opportunities for imposition in contracts to be fulfilled so far away from the place where they are undertaken, is obvious, and the instances of cruelty and rapacity exhibited in the emigration trade are among the most atrocious that have ever disgraced human nature. These led to the appointment of a department of government called the Emigration Commission, and to the passing of the Passengers' Act of 1849, which regulates the build and character of the vessels which may carry emigrants to certain points, limits the number that may be conveyed, requires the sufficiency of the provisions and other stores to be certified, and provides for proper medical attendance. The British government cannot, of course, enforce obedience to their regulations in vessels belonging to citizens of the United States, after these have gone to sea; but before allowing such vessels to receive emigrants, the owners must find security in this country for the performance of their undertakings, and to a considerable extent the American government has co-operated with ours for the protection of emigrants.

The greatest amount of emigration from any one country is from the United Kingdom. There is also a continual stream of emigration from Germany, which has formed several separate German communities in the States of America, and also in the British colonies there, and in Australia. A new kind of emigration, which has come under the charge of the British authorities, is that of hill coolies from India, and of Chinese, both for the purpose of supplying free labour in the sugar-growing and other tropical colonies where Europeans cannot work with safety. A difficulty which more or less attends all kinds of emigration is peculiarly felt in this kind—viz., that of keeping the two sexes at anything near to an equality.

The annual reports of the Emigration Commissioners afford a continued series of statistics on emigration, especially from the United Kingdom. From the 21st of these, coming down to the end of the year 1860, it appears that the total number who had emigrated from the United Kingdom for 46 years—viz., from 1815 inclusive—was 5,046,067. Emigration received a great impulse from the commercial crisis of 1847, and the potato disease at the same period. In 1845, the total number was 93,501; in 1846, it was 129,851; and in 1847, it reached 258,270. The largest number who emigrated in any one year was 368,764 in 1851. The smallest number in any year during the last 20 was in 1843—viz., 57,210. The former (viz., the largest number) were distributed thus: to the North American colonies, 32,873; to the United States, 244,261; to the Australian colonies and New Zealand, 87,881, and to other places, 3749. The other number (the smallest) were thus distributed: viz., to the North American colonies, 23,518; to the United States, 28,335; to Australia and New Zealand, 3476; and to other places, 1881. The number who emigrated in 1860 was 127,969;

being—to the North American colonies, 9786; to the United States, 87,000; to Australia and New Zealand, 24,302; and to other places, 6881. Again, taking the parts of the empire whence they came, we find that there were—from England, 103,001; from Scotland, 3872; and from Ireland, 21,596: the returns, however, only apply to the port of embarkation, not the place where the emigrant may have been born or lived. Of the total, 71,507 were entered as male, and 55,929 as female, while of 1033, the sex was not distinguished.

EMIGRATION OF PAUPERS. The manifest advantages derivable both to themselves and the community which supports them from the emigration of paupers, and more particularly of pauper children, to the colonies, have led to several legislative provisions on the subject. The object of these enactments is, on the one hand, to facilitate pauper emigration, and, on the other, to prevent it from being pressed on paupers by the guardians to the extent of interfering with their personal freedom of choice. By 4 and 5 Will. IV. c. 76, s. 62, parishes in England and Wales are empowered to raise funds by a yearly rate for defraying the expenses of poor persons willing to emigrate. The sums advanced may be recovered from any person above the age of 21, who (or whose family or any part thereof), having consented to emigrate, shall refuse to do so, or who having emigrated, shall return. 11 and 12 Vict. c. 110, empowers the guardians of a parish to promote the voluntary emigration of the poor having settlements therein, in accordance with the provisions of the statute above cited, and to charge the expenses upon the ordinary funds for the relief of the poor. By 12 and 13 Vict. c. 103, s. 20, guardians are empowered to expend a sum not exceeding £10 for each person, on the emigration of paupers having settlements in their union or parish, without a previous vestry meeting. 13 and 14 Vict. c. 101, s. 4, enacts that it shall be lawful for the guardians of any parish or union to expend money in the emigration of any poor orphan or deserted child under the age of 16 years, having no settlement, or the place of whose settlement is unknown, and to charge the expense so incurred to the same parish to which such orphan or deserted child was chargeable at the time of the emigration. The section concludes with the provision, that no emigration of any such orphan or deserted child, under any of the above-mentioned powers, shall take place until such orphan or deserted child shall have consented thereto before the justices assembled in petty sessions, and a certificate of such consent, under the hands of two of the justices present thereat, shall have been transmitted to the Poor-law Board.

These statutory provisions do not apply to Scotland, and there are no corresponding clauses in the Scottish acts. The emigration of paupers in Scotland, if effected at all, must be the result of a private arrangement between the parish and the emigration commissioner, or other person willing to contract for their passage—the consent of the pauper being, of course, requisite. The directors of ragged schools have frequently directed their attention to the subject, but they have invariably been withheld from trying the experiment of sending the children to the colonies, partly by the want of funds, and partly by the want of arrangements for their reception when they arrived.

ÉMIGRÉS, the name given more especially to those persons who quitted France during the Revolution. After the insurrection at Paris, and the taking of the Bastile, 14th July 1789, the princes of the royal family departed from France. They were followed, after the adoption of the constitution of 1791, by all who considered themselves aggrieved by the destruction of their privileges, or who were exposed to persecution. Nobles quitted their châteaus; officers, with whole companies, passed the frontiers. Crowds of priests and monks fled to escape the oath of allegiance to the constitution. Belgium, Piedmont, Holland, Switzerland, and, above all, Germany, were overrun with fugitives of every age. Only a few had been able to save their property; the greater portion were in a state of destitution, and sank into utter demoralisation. A court had formed itself round the princes at Coblenz; a government, with ministers and a court of justice, had been established, and communication was kept up with all the foreign courts unfavourable to the Revolution. This conduct imbittered France, aggravated the position of the king, and drove the revolutionary party forward in their sanguinary career. Under the command of the Prince of Condé, a body of émigrés was formed, which followed the Prussian army into Champagne. The result was that the severest laws were now put in force against the émigrés. Their lands were confiscated. The penalty of death was proclaimed against any one who should support or enter into communication with them. Thirty thousand persons were placed upon the list of émigrés, and exiled for ever from the soil of France, although many of them had refused to bear arms against their country. Not until after the failure of their attempt to land at Quiberon in 1795, did the émigrés abandon all thoughts of penetrating into France by force of arms. Condé's corps, after the peace of Luneville, was obliged formally to dissolve, and sought an asylum in Russia. Even under the Directory, however, many had endeavoured to obtain permission to return to France. The general amnesty proclaimed by the First Consul was therefore joyfully hailed by the greater portion of the émigrés. Many, however, did not return home till after the downfall of Napoleon. Dignities, pensions, and offices were now showered upon these faithful adherents; but, according to the charter of 1814, they were unable to recover either their estates or their privileges. Finally, on the motion of the minister Villèle, the émigrés who had lost their landed estates, by the law of the 27th April 1825, received a compensation of 30 million francs yearly on the capital of 1000 million francs. After the July revolution, however, the grant was withdrawn. Compare Antoine de Saint-Gervais, *Histoire des Emigrés Français* (3 vols., Paris, 1823), and Montrol, *Histoire de l'Emigration* (2d edit., Paris, 1825).

EMI'LIAN (or **ÆMILIAN**) **PRO'VINCES**, a name now employed to designate a portion of the recently formed kingdom of Italy, comprising the northern part of the States of the Church (the Romagna), and the duchies of Parma and Modena. The name is derived from the ancient *Via Æmilia* (a continuation of the *Via Flaminia*, or great northern road), which passed through these territories. The E. P. were formally annexed to Sardinia in April 1860. See ITALY.

E'MINENCE, a title given to cardinals by Urban VIII. Up to the period of his pontificate, they had been called Most Illustrious and Most Reverend. The assumption by the Roman Catholic clergy of this and other ecclesiastical titles, not having reference to any 'pretended province, or to any pretended see or diocese,' are not struck at by the Act 14 and 15 Vict. c. 49, to prevent the assumption of certain ecclesiastical titles in respect of places in the United Kingdom. See ECCLESIASTICAL TITLES ASSUMPTION ACT.

E'MIR, an Arabic word, equivalent to 'ruler,' is a title given in the East, and in the North of Africa, to all independent chieftains, and also to all the actual or supposed descendants of Mohammed through his daughter Fatima. The latter are very numerous throughout the Turkish dominions, but although entitled by birth to be classed among the first four orders of society, they enjoy no particular privileges or consideration; on the contrary, they are found engaged in all sorts of occupations, and are to be met with among beggars, and the lowest of the populace, as frequently as among the mollahs. Their privileges are confined to a few unimportant matters, chiefly to the exclusive right to wear turbans of a green colour, that having been the favourite colour of the Prophet. They are placed under the supervision of the Emir-Beshir. In former times, the title of Emir was borne by the leaders in the religious wars of the Mohammedans, as well as by several ruling families, such as the Thaherides and Samanides in Persia, the Tulunides in Egypt, the first seven Ommaiades in Spain. The title Emir, in connection with other words, likewise designates different offices. *Emir-al-Mumenin*, 'Prince of the Faithful,' is the title assumed by the califs themselves; *Emir-al-Muslemin*, signifying the same thing, was the title of the Almoravides. *Emir-al-Omrah*, 'Prince of Princes,' was the title of the first minister, under the califs and the East Indian Moguls, who united in his own person the highest civil and military dignities. It is now the title of the governors of different provinces. The Turkish master of the horse is styled *Emir-Achor;* the standard-bearer, *Emir-Alem;* the surveyor of markets in Turkey, *Emir-Bazaar;* and the leader of the caravans of pilgrims to Mecca, *Emir-Hadji.*

E'MLY, an ancient Irish see, united to Cashel in 1568.

EMME'NAGOGUES, medicines intended to restore, or to bring on for the first time, the menstrual excretion in women. The emmenagogues chiefly in use are the preparations of aloes, iron, myrrh, and other stimulants in connection with purgatives; and also the local use of the warm bath, leeches, fomentation, &c. Some recommend still more powerful and direct applications to the uterine mucous membrane; as galvanic pessaries, lunar caustic, scarifications, &c.; but these are not in general use. See MENSTRUATION.

E'MMERICH, a town of Rhenish Prussia, is situated on the right bank of the Rhine, on the borders of Holland. It is a very old town, and has a Dutch character of cleanliness. It has a custom-house, an orphan-house, a gymnasium, and several ecclesiastical edifices. E. has manufactures of cloth, linens, and leather, and some shipping. Pop. 7116.

E'MMET. See ANT.

EMO'LLIENTS (from Lat. *mollis*, soft), substances used to soften the textures to which they are applied, as poultices, fomentations, &c., externally, and Demulcents (q. v.) internally.

EMO'TION. This is the name for one of the comprehensive departments of the human mind. It is now usual to make a threefold division of the mind—Emotion, or Feeling; Volition, or Action prompted by Feelings; and Intellect, or Thought. It is not meant that these can be manifested in absolute separation; or that we can be at one time all emotion, another time all volition, and again all thought, without either of the other two. But although our living mind is usually a concurrence, in greater or less degree, of all of them, still they can be distinguished as presenting very different appearances, according as one or other predominates. Wonder, Anger, Fear, Affection, are emotions; the Acts that we perform to procure pleasurable feelings, and avoid painful, are volitions, or exercises of Will; Memory and Reasoning are processes of Thought, or Intellect.

Emotion is essentially a condition of the waking, conscious mind. When asleep, or in a faint, or in any of those states called 'being unconscious,' we have no emotion; to say that we have would be a contradiction, which shews that 'emotion' is a very wide and comprehensive word. In fact, whenever we are mentally excited 'anyhow,' we may be said to be under emotion. Our active movements and intellectual processes can sometimes go on with very little consciousness; we may walk and scarcely be aware of it; trains of thought may be proved to have passed through the mind while we are unconscious of them. Now, it is these unconscious modes of Volition and Intellect that present the greatest contrast to emotion; shewing how nearly co-extensive this word is with mental wakefulness, or consciousness, in its widest signification.

Emotion, then, is of the very essence of mind, although not expressing the whole of mind. There are three distinct kinds or divisions of it: Pleasures, Pains, and Excitement that is neither pleasurable nor painful.

Every kind of Pleasure is included under emotion in its widest acceptation. The pleasures of the Senses are as much of an emotional character as those pleasures that are not of the senses—as, for example, those of Power, Pride, Affection, Malevolence, Knowledge, Fine Art, &c. Every one of our senses may be made to yield pleasurable emotion; and all those other susceptibilities, sometimes called the special emotions, of which a classification is given below, are connected with our pleasures or our pains. What pleasure is in its inmost nature, each one must find from his own experience; it is an ultimate fact of the human consciousness which cannot be resolved into anything more fundamental, although, as will be seen, we can lay down the laws that connect it with the other manifestations of mind—namely, action and thought, and with the facts of our corporeal life.

In the next place, Pain is a species of emotion. We know this condition as being the opposite of Pleasure, as the source of activity directed to its removal or abatement, and as the cause of a peculiar outward appearance, known as the Expression or Physiognomy of Pain. All the inlets of pleasure are also inlets of pain. The various sensibilities of the mind, whether the outward senses, or the more inward emotions, give rise at one time to pleasure, at other times to pain, the conditions of each being generally well understood by us; we can define the agencies that cause pleasure or suffering through the skin, the ear, or the eye.

But it is requisite, further, to recognise certain modes of Neutral Excitement, in order to exhaust the compass of emotion. We are very often roused, shocked, excited, or made mentally alive, when we can hardly say that we are either pleased or put to pain. The mind is awakened and engrossed with some one thing, other things are excluded; and the particular cause of the excitement is impressed upon us so as to be afterwards remembered, while all the time we are removed alike from enjoyment and from suffering. This is a kind of emotion that has its principal value in the sphere of intellect. The emotion of Wonder or Astonishment is not seldom of this nature; for although we sometimes derive pleasure, and sometimes the opposite, from a shock of surprise, we are very frequently affected in neither way, being simply *impressed.* The strange appearance of a comet gives far more of this neutral effect than of the others. It is a thing that possesses our mind at the time, and is afterwards vividly remembered by us, and these are the chief consequences of its having roused our wonder.

The Physical Accompaniments of emotion are a part of its nature. It has been remarked in all ages, that every strong passion has a certain outward expression or embodiment, which is the token of its presence to the beholder. The child soon learns to interpret the signs of feeling. Joy, Grief, Affection, Fear, Rage, Wonder, have each a characteristic expression; and painters, sculptors, and poets, have adopted the demeanour of passion as a subject for their art. There must be some deep connection in the human frame between the inward states of consciousness and the physical or corporeal activities, to produce results so uniform throughout the human race. When we study the facts closely, we obtain decisive proof of the concurrence of the following members and organs in the manifestation of feeling.

In the first place, the *muscles* or *moving organs* are affected. Under strong excitement, the whole body is animated to gesticulation; in less powerful feelings, the expression confines itself more to the *features* or the movements of the face. These last have been analysed by Sir Charles Bell. The face has three centres of movement—the Mouth, Eyes, and Nose; the mouth being most susceptible, and therefore the most expressive feature. In the Eyes, expression is constituted by the two opposite movements of the eyebrows; the one raising and arching them (prompted by a muscle of the scalp, *occipito-frontalis*), the other corrugating and wrinkling them. The one movement is associated with pleasing states, the other with painful. The Nose is acted on by several muscles, the most considerable of which is one that raises the wing together with the upper lip, and is brought into play under the disgust of a bad smell and in expressing dislike generally. The Mouth is principally made up of one ring-like muscle (*orbicularis*), from which nine pairs radiate to the cheeks and face. In pleasing emotions, the mouth is drawn out by the action of two pairs of muscles, named the buccinator and zygomatic, situated in the cheek. The expression of pain is determined by the contraction of the aperture of the mouth, through the relaxation of those muscles, and the contraction of the ring-like muscle that constitutes the flesh of the lips; and by two muscles in the chin, one depressing the angle of the mouth, and the other raising the middle of the lower lip, as in pouting. Besides the features, the Voice is instinctively affected under strong feelings; the shouts of hilarious excitement, the cry of sharp pain, and the moan of protracted agony, are universally known. Another important muscle of expression is the Diaphragm, or midriff, a large muscle dividing the chest from the abdomen, and regularly operating in expiration. In laughter, this muscle is affected to convulsion.

In the second place, the *organic functions* of the system are decidedly influenced for good or evil under emotion. The glandular and other organs acted on in this way comprehend the most important viscera of the body. The Lachrymal Secretion is specifically affected under passion; the flow of tears being accelerated to a rush, instead of pursuing the tranquil course of keeping the eyeball moist and clean. The states of the Sexual Organs are connected with the strongest feelings of the mind, being both the cause and the effect of mental excitement. The Digestion is greatly subject to the feelings, being promoted by joy and hilarity, not in too great excess, and arrested and disturbed under pain, grief, terror, anger, and intense bodily or mental occupation. The Skin is known to respond to the condition of the mind; the cold sweat in fear is a derangement of its healthy functions. The Respiration may be quickened or depressed according to the feelings. The action of the Heart and the Circulation of the Blood are subject to the same causes. The nature of this influence was explained under **Blushing.** Lastly, in women, the Lacteal Secretion participates in the states of emotion, being abundant, healthy, and a source of pleasure in a tranquil condition of mind, while grief and strong passions change it to a deleterious quality.

The connection between mental emotion and bodily states being thus a fact confirmed by the universal experience of mankind, can we explain this connection upon any general law or principle of the human constitution? Have we any clue to the mysterious selection of some actions as expressing pleasure, and others as expressing pain? The reply is, that there is one principle or clue that unravels much of the complexity of this subject—namely, that *states of pleasure are usually accompanied with an increase in some or all of the vital functions, and states of pain with a depression or weakening of vital functions.* This position may be maintained on a very wide induction of facts, many of them very generally recognised, and others open to any careful observer; there being, however, some appearances of an opposite kind, which have to be satisfactorily accounted for, before we can consider it as fully established.

If we consider first the respective *agents* or causes of pleasure and pain, we must acknowledge that they are very generally of a nature to accord with the view now stated. How many of the sources of pleasure are obviously sources of increased energy of some vital organs. The case of Food is too obvious to need any comment. Warmth within limits both confers pleasure and stimulates the skin, the digestion, and other functions. Fresh air exhilarates the mind, while quickening the respiratory function. Light is believed to stimulate the vital actions no less than the mental tone. And if there be some pleasures of sense, such as mere sweetness of taste, fragrant odours, music, &c., that do not obviously involve greater energy of vital function, they might be seen to do so, if we knew more than we do respecting the operation of the various organs, and we are certain that they do not have the opposite effect. Medical authorities are so much impressed with the general tendency of pleasures, that they include them in the list of *stimulants* in cases of low vitality. If we pass from the senses to the special emotions, such as Wonder, Power, Tender Affection, Taste, we find that when those are pleasing, they also increase the animal forces at some point or other. A stroke of victory sends a thrill through the whole system; and if the pulse were examined at that moment, we should find that it beats stronger. The illustration for Pains is exactly parallel, but still more striking. It is notorious that hurts, wounds, fatigue, ill-health, hunger, chillness, nauseous tastes and odours, the silence of a prison, the gloom of utter darkness, failure, humiliation, contumely, deprivation of one's usual comforts and pleasures—while causing pain, cause in a corresponding degree a depression of the powers of the system. There are some apparent exceptions, as in the stimulus of the whip, the bracing agency of cold, and the effect of misery generally in rousing men from lethargy to action, but these could all be shewn to be quite compatible with the main principle.

If we turn from the agents to the *expression*, or modes of manifestation, of the opposing mental conditions, we shall find that the facts are of the same general tenor, although with some seeming exceptions. Joy makes a man spontaneously active, erect, animated, and energetic. It is as if a flush of power were diffused through his members; and the efforts he is then prompted to, lead to no painful exhaustion. The opening up of the features, by the elevation of the eyebrows and the retraction of the mouth, indicates that the stream of energy has coursed over the face. In a still greater shock, the convulsiveness of laughter, by which respiration is quickened, attests the superabundance of the animal spirits. The body stands more erect, and every act done is done with more emphasis. Grief and depression are the opposite in every particular. The frame is languid and stooping, the features lifeless, the voice is a feeble wail; and although there is a species of convulsion attending on this condition of mind, it is a marked contrast to the other. The sob is caused by the *partial paralysis* of the diaphragm, which necessitates great voluntary efforts in order that breathing may proceed. The choking sensation at the throat is also a species of paralysis from loss of vital power. The convulsions arising under such circumstances are productive of an exhausting reaction, which is the case with all the energetic movements stimulated by extreme pain.

Such is undoubtedly the general fact. But why should pain stimulate, or give strength to, *some special* muscles, such as the corrugator of the eyebrow, and the depressor of the angle of the mouth? This has appeared a great difficulty to the ablest physiologists. It would look as if pleasure coincided with an energetic wave sent to some muscles, and pain with an energetic wave sent to others; so that the opposite conditions of mind are equally accompanied by an accession of power to some bodily member. But if we examine the matter more narrowly, it will probably turn out that the muscles that seem to be stimulated under pain, are not so in reality, but obtain the upper hand through the general relaxation of the system. Thus, take the mouth. We know the state of the mouth in languor, inaction, and sleep. We know that when we are roused in any way, the muscles of the face operate and draw the mouth asunder in a variety of forms. Pleasure corresponds with our energetic moods, pain causes a collapse towards the sleepy and exhausted condition which represents a state of departed energy. So the collapse of the body might seem an exertion of the *flexor* muscles, or those that bend the frame forward; but we are well aware that such collapse takes place when the system is totally lifeless. A renewed energy, as a matter of course, makes us stand erect.

This is a part of the case in reply to the objections arising from a specific expression of pain, but not the whole; and the answer to the difficulties still remaining is furnished by a fact that, if well authenticated, will probably dispose of nearly all the exceptions to the general principle now contended for. It is the organic functions, *more than the muscular system,* whose increased vitality coincides with pleasurable feeling, and their diminished action with pain. Muscular exercise is often highly agreeable, but the pleasure of *resting* after exercise is still more so. Now, there can be little doubt that what happens in the state of healthy repose is this: the amount of vital force stimulated by exercise—the increased energy derived from plying the lungs and heart—is now allowed to leave the active members, and to pass to the other organs—the digestion, skin, and various secreting glands—and it is their aggrandisement that is associated with the comfortable sensations of repose and sinking into sleep. Thus, the abating of muscular energy may be a cause of pleasure, provided the organic functions are raised in consequence; but it may be maintained as a highly probable supposition, that a certain health and energy of some or all of these functions (it is difficult to draw a specific line) is essential to pleasurable feeling. We may doubt whether even mental causes can materially raise the tone of enjoyment, if they do not also raise the activity of some of these organs. Not only may a person be very happy and comfortable in the prostration of the muscular energy, even in a sick-bed, but one way of procuring comfort is to induce a total inaction of the moving members, to allow all the available nervous power to pass to the viscera and secretions. Hence a *forced relaxation* of the muscles *generally*, by the employment of *some* of them, is a means of soothing the mind under pain. Thus, the active intervention of certain small muscles—such as the corrugator of the eyebrows, the orbicular muscle of the mouth, and the depressor of the angle of the mouth—by relaxing a much greater body of muscle, is the means of setting free vital energy for behoof of the other parts of the system. This would explain the mental relief furnished by an assumed sadness of feature, and a voluntary collapse of the body generally.

It would appear, then, that the stimulus of muscle is not necessarily or immediately a cause of pleasure; while the stimulus of the organic functions is so. Thus, a bracing cold quickens the activities, but is apt to cause a shock of pain, by temporarily checking the action of the skin; when the reaction arrives, this check is converted into stimulation, and the mental state is altered in like manner. A bitter tonic must be supposed to act on the same principle.

The emotions of the human mind may be classified under two heads:

First—The pleasures, and pains, and modes of excitement growing out of the exercise of the Senses, the Movements, and the Appetites. See SENSES. The five senses, commonly recognised, are partly sources of pleasure and pain, in which case they yield Emotion, and partly sources of Knowledge, by which they are related to the Intellect. There are other sensibilities not included in the five senses, but ranking with them in those particulars—as the feelings of Muscular Exercise and Repose, and the sensations of Digestion, Respiration, &c.

The second head comprises the Special Emotions not arising immediately out of Sensation, although connected therewith. These have been variously classified. The following is one mode of laying them out: 1. Feelings of Liberty and Restraint; 2. Wonder; 3. Terror; 4. Tender Affections; 5. Emotions of Self-complacency, Love of Approbation, &c.; 6. Sentiment of Power; 7. Irascibility; 8. Emotions of Action, including the interest of Pursuit or Plot; 9. Emotions of Intellect, Love of Knowledge, Consistency, and Inconsistency; 10. Fine Art Emotions, or Taste; 11. The Moral Sense.

On this subject, see Müller's *Physiology, Movements due to the Passions of the Mind;* Bell's *Anatomy of Expression;* Stewart on the *Active Powers;* Bain on the *Emotions and the Will*, &c.

EMPA'NNEL—*Empanellare vel ponere in assisis et juratis*—to write in a schedule or roll the names of such jurors as the sheriff returns to pass upon any trial. The judges of assize in England, before commencing their circuits, issue precepts to the sheriffs of the several counties, calling upon them to summon a sufficient number of jurors to serve upon the grand and petty juries. In compliance with this order, the sheriff prepares lists, called the Panels (q. v.) of the jury, and the persons named in the lists are thereupon summoned to attend at the assizes.

EMPECINA'DO, Don Juan Martin Diaz, el, one of the leaders of the Spanish revolution of 1820, was born in 1775. He was the son of poor parents, and entered the Spanish army in 1792. At the head of 5000 or 6000 men, he carried on a guerilla warfare against the French during the Peninsular struggle, and acquired great distinction. In 1814, he was appointed colonel in the regular army, and the king himself created him field-marshal; but in consequence of petitioning Ferdinand, in 1815, to reinstitute the Cortes, he was imprisoned, and afterwards banished to Valladolid. On the outbreak of the insurrection in 1820, he took a prominent part on the side of the constitutionalists, and on several occasions exhibited great courage, daring, and circumspection. After the triumph of the absolutists in 1825, he was arrested, exposed in an iron cage to the contumely of the passers-by, and finally executed on a common gibbet, amidst the ferocious yellings of a debased and liberty-hating populace.

EMPE'DOCLES, a Greek philosopher of Agrigentum, in Sicily, lived about 450 B.C. So great was the estimation in which he was held by his fellow-citizens as a physician, a friend of the gods, a predicter of futurity, and a sorcerer, or conjuror of nature, that they are said to have offered him the sovereignty. But being an enemy of tyranny, he declined it, and was the means of delivering the community from the dominion of the aristocracy, and bringing in a democracy. There was a tradition that he threw himself into the crater of Etna, in order that his sudden disappearance might beget a belief in his divine origin; this, however, can only be regarded as a mere fable, like the story told by Lucian, that Etna threw out the sandals of the vain philosopher, and thus destroyed the popular belief in his divinity. The statement of Aristotle is, that he died at the age of 60; later writers extend the period of his life considerably further, but their testimony is not equal in weight to that of Aristotle.

In E., philosophic thought is bound up with poetry and myth even in a higher degree than in Parmenides (q. v.). His general point of view is determined by the influence of the Eleatic school upon the physical theories of the Ionic philosophers. He assumed four primitive independent substances—air, water, fire, and earth, which he designates often by the mythical names Zeus, Here, &c. These four *elements*, as they were called, kept their place till modern chemistry dislodged them. Along with material elements, he affirmed the existence of two moving and operating powers, love and hate, or friendship and strife, the first as the uniting principle, the second as the separating. The contrast between matter and power, or force, is thus brought out more strongly by E. than by previous philosophers. The origin of the world, or cosmos, he conceived in this way: In the beginning, the elements were held in a sort of blended unity, or *sphere*, by the attractive force of love; when hate, previously exterior, penetrated as a repelling and separating principle. In this process of separation, which gives rise to the individual objects of nature, he seems to have assumed a series of stages, a gradual development of the perfect out of the imperfect, and a periodical return of things to the elemental state, in order to be again separated, and a new world of phenomena formed. From the fragments that we possess of his didactic poem, it is not quite clear in how far he considered fire as the substratum of strife, and water as the substratum of love, and ascribed various creations to the predominance of one or the other of these principles. Of his opinions on special phenomena, may be mentioned his doctrine of emanations, which proceeding from one thing enter into corresponding openings in other things. By this assumption in connection with the maxim, that like is known only by like, he thought to explain the nature of perception by the senses. He attempted to give a moral application to the old doctrine of the transmigration of souls, his views of which resembled those of Pythagoras. The fragments of E. have been edited by Sturz (2 vols., Leip. 1805), Karsten (Amst. 1838), and Stein (Bonn, 1852).

E'MPEROR (Lat. *imperator*). The original signification of this, which in the modern world has become the highest title of sovereignty, can be understood only when it is taken in conjunction with *imperium*, which in the Roman political system had a peculiar and somewhat technical meaning. The imperium of a magistrate, be he king or consul, was the power which he possessed of bringing physical force into operation for the fulfilment of his behests. This power was conferred by a *lex curiata*, and it required this authorisation to entitle a consul to act as the commander of an army. In the case of the kings also, the imperium was not implied in their election, but was conferred separately, by a separate act of the national will. 'On the death of King Pompilius,' says Cicero, 'the *populus* in the *comitia curiata* elected Tullus Hostilius king, upon the rogation of an *interrex;* and the king, following the example of Pompilius, took the votes of the *populus*, according to their *curiæ*, *on the question of his imperium*.'—*Republic*, ii. 17. Now, it was in virtue of this imperium that the title imperator was given to its possessor. Far from being an emperor in the modern sense, he might be a consul or a proconsul; and there were, in fact, many imperatores, even after the title had been assumed as a prenomen by Julius Cæsar. It was this assumption which gradually gave to the title its modern signification. In republican times, it had followed the name, and indicated simply that its possessor was *an* imperator, or one possessed of the imperium; now it preceded it, and signified that he who arrogated it to himself was *the* emperor. In this form it appears on the coins of the successors of Julius. After the times of the Antonines, the title grew into use as expressing the possessor of the sovereignty of the Roman world, in which sense *Princeps* also was frequently employed. In the introduction to the *Institutes*, Justinian uses both, in speaking of himself, in the same paragraph. From the emperors of the West, the title passed to Charlemagne, the founder of the German empire. When the Carlovingian family expired in the German branch, the imperial crown became elective, and continued to be so till it ceased—Francis II., who in 1804 had declared himself hereditary Emperor of Austria, having laid it down in 1806. In addition to the Emperor of Austria, there are now in Europe the Emperor of Russia and the Emperor of the French—the latter of whom, being an elected monarch, holds a position, in one respect at least, resembling that of the old emperors of the second Western Empire, with whom it is sometimes thought that he is not unwilling to be identified.

EMPEROR MOTH (*Saturnia pavonia minor*), a moth of the same family (*Bombycidæ*) with the silk-worm moth, and of a genus to which the largest of lepidopterous insects belong. The E. M. is the largest British lepidopterous insect. Its expanse of wings is about three and a half inches. Each wing is ornamented with a large eye-like glassy and transparent spot, and such spots are exhibited by many of the genus. The Peacock Moth (*S. pavonia major*) is the largest European species, and attains an expanse of five inches across the wings. The cocoons of the E. M. are remarkable for being formed internally of stiff convergent elastic threads, which readily permit the escape of the insect, but prevent the entrance of intruders. The cocoons of this genus of moths are invested with silk, which in China and India is collected for use. See Silk-worm.

Emperor Moth, with Caterpillar, Pupa, and Cocoon.

EMPETRA'CEÆ. See Crowberry.

E'MPHASIS. See Accent.

EMPHYSE'MA, an unnatural distension of a part with air. Emphysema of the cellular texture often takes place in the neighbourhood of wounds of the air-passages in the lungs, and is the consequence of an escape of air from these parts. Emphysema of the lungs is the consequence either of distension or of rupture of the air-vesicles, especially on the surface. It is rarely that emphysema is produced otherwise than mechanically; but collections of fluid in a state of decomposition sometimes give out gases, which penetrate and distend the textures with which they are in contact.

EMPHYTEU'SIS (Gr., an implanting), in the Roman law, a perpetual right in a piece of land, for which a yearly sum was paid to the superior or original proprietor. The emphyteusis much resembled our feudal holdings, so much so, indeed, that Craig and other Scotch writers apply the term to them. The sum paid to the superior was called the *canon emphyteuticus.* The tenant handed down the right to his heirs, and was entitled to sell, but only on condition of giving the first offer to the dominus. The consent of the lord, however, was not necessary to entitle him to impignorate the emphyteuta for his debt. Justinian put the emphyteusis and the *ager vectigalis* on the same footing. The latter is the term applied to lands leased by the Roman state, by towns, ecclesiastical corporations, and by the vestal virgins. There were several ways in which the right of emphyteusis might cease. If the tenant died without heirs, it reverted to the dominus. He might also lose his right by injuring the property, by non-payment of his rent or public burdens, or by alienation without notice to the dominus. It was, of course, also in his power to renounce it.

EMPI'RIC (Gr. *empeirikos*, an experimentalist or searcher after facts in nature, from *peiraō*, I try). It is difficult to say at what period, or in what manner, this word began to degenerate from its original meaning. Probably the idea was, that empiricism, or experimental science, excluded, because it did not require, the reasoning faculties for its cultivation; and, therefore, the profession of empiricism came to be synonymous with vulgar ignorance. The empirics were a regular sect of ancient physicians in the time of Celsus and Galen, who gives us some insight into their modes of thought and practice. They laid great stress on the unprejudiced observation of nature; and thought that, by a careful collection of observed facts forming a history, the coincidence of many observations would lead to unalterable prescriptions for certain cases. The later adherents of the school excluded all theoretical study, even that of anatomy, and were guided solely by tradition and their individual experience. By an empiric in medicine is now understood a man who, from want of theoretic knowledge, prescribes remedies by guess according to the name of the disease or to individual symptoms, without thinking of the constitution of the patient or other modifying circumstances. What are called *specifics* are administered on this principle, or want of principle.

EMPI'RICAL FO'RMULA, in Chemistry, is the mode of expressing the constituents of a compound in symbols, where the total quantity of each element is written down without reference to any particular order or state of combination. Thus, alcohol consists of 4 equivalents of carbon, 6 of hydrogen, and 2 of oxygen; and its empirical formula is $C_4H_6O_2$. When regarded, however, as a member of a family group, the constituents are arranged in a more systematic manner, as in C_4H_5O,HO, representing the theoretical constitution of alcohol, which, strictly speaking, is the hydrated oxide of ethyl. Again, the rational formula of Epsom salts, which is $MgOSO_3+7HO$, represents it theoretically as a hydrated sulphate of magnesia; while the empirical formula MgH_7SO_{11} merely tells us that it consists of 1 equivalent of magnesium (Mg), 1 of sulphur (S), 7 equivalents of hydrogen, and 11 of oxygen.

EMPIRICAL LAWS are such as express relationships, which may be merely accidental, observed to subsist among phenomena, but which do not suggest or imply the explanation or cause of the production of the phenomena. They are usually tentative, and form stages in the progress of discovery of causal laws. Bode's law of the distances of the planets from the sun may be accepted as an example of an empirical law.

E'MPOLI, a town of Tuscany, in the kingdom of Italy, is situated in a remarkably beautiful and fertile district on the left bank of the Arno, 16 miles west-south-west of Florence. It is a thriving town, is surrounded by walls flanked with towers, and although its streets are narrow, it is on the whole well built, and has some good squares. The most interesting building is the Collegiate Church, built in 1093, the fine original façade of which has suffered but little from modern *improvements*, although the other portions of the building were considerably altered in 1738. This church contains several good paintings, and has also some excellent specimens of sculpture, among which is one by Donatello. E. has several manufactories of cotton, leather, straw-hats, and glass, a considerable trade in agricultural produce, and a weekly market of some importance. Pop. 6500.

EMPO'RIUM (Gr. *emporion*, trading-place). The word is derived from *emporos*, which signified in Homer's time a person who sailed in a ship belonging to another, but latterly meant a wholesale merchant, as opposed to a retailer, who was called *kapēlos.* An emporium thus came to be applied to the receptacles in which wholesale merchants stowed their goods in seaports and elsewhere, and thus corresponded to our warehouse, as opposed to a shop.

E'MPTION. See SALE.

EMPYE'MA (Gr.), an internal suppuration, a word now applied exclusively to a collection of pus in the pleura, causing pressure of the lung, and often attended by hectic fever. See PLEURISY.

EMPYREU'MA (Gr. *empyreuo*, I kindle), the burned smell and acrid taste which result when vegetable or animal substances are decomposed by a strong heat. The cause of the smell and taste resides in an oil called *empyreumatic*, which does not exist naturally in the substance, but is formed by its decomposition.

EMS, usually called the *Baths of Ems*, to distinguish it from other places of the same name, a bathing-place known to the Romans, and celebrated in Germany as early as the 14th century. It is situated about four miles from Coblenz, near the most picturesque parts of the Rhine, in a beautiful valley in the duchy of Nassau, traversed by the navigable river Lahn, and surrounded by wooded hills. Pop. 3600. Its warm mineral springs belong to the class containing soda. The only essential difference between the numerous springs is in the temperature varying from 24° to 46° Reaumur, and in the greater or lesser amount of carbonic acid gas contained in them. The bathing establishments are comfortably, and even luxuriously fitted up, and the same may be said of the hotels and private lodging-houses.

EMS, a river in the north-west of Germany, rises in Westphalia, at the southern base of the Teutoburger Wald, and flowing first in a north-western, and then through the Hanoverian territories in a northern direction, empties itself into Dollart Bay, an estuary of the German Ocean, after a course of 210 miles. Its chief affluents are the Aa, the Haase, and the Leda. It is navigable for vessels of 100 tons as high as Pappenburg, which is 25 miles up the river from Dollart Bay. The E. drains a basin of about 5000 square miles in extent. In 1818, it was connected by a canal with the Lippe, and thus with the Rhine, which greatly increased its importance with respect to commerce and navigation.

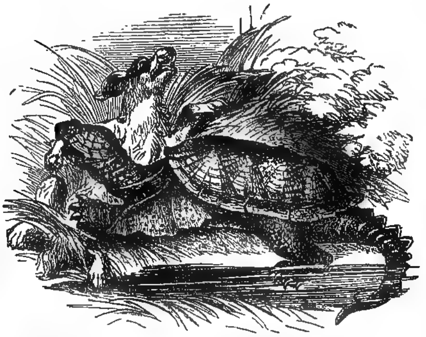
E'MU (*Dromaius*—or *Dromecius*—*Novæ Hollandiæ*), a very large bird, one of the *Struthionidæ* or *Brevipennes*, a native of Australia, and widely diffused over the southern parts of that continent and the adjacent islands. It is by some ornithologists referred to the same genus with the cassowary, but the differences are very considerable; the bill being horizontally depressed, whilst that of the cassowary is laterally compressed, the head feathered, and destitute of bony crest; the throat is nearly naked, and has no pendent wattles; the feet are three-toed as in the cassowary, but the claws are nearly of equal length. The name emu or emeu was given by the older voyagers and naturalists to the cassowary, but is now the invariable designation of the Australian bird. The emu is even taller than the cassowary, which it resembles in the general character of its plumage. Its wings are mere rudiments hidden beneath the feathers of the body. Its colour is a dull brown, mottled with dingy gray; the young are striped with black. When assailed, it strikes backwards and obliquely with its feet, like the cassowary, and it is so powerful that a stroke of its foot is said to be sufficient to break a man's leg. Dogs employed in hunting it are often injured by its kicks, but well-trained dogs run in before it, and spring at its neck. It cannot fly, but runs very fleetly. It is timid and peaceful, and trusts altogether to its speed for safety, unless hard pressed. In a wild state, it sometimes occurs in small flocks; but it has now become rare in and around all the settled parts of Australia. The extinction of the species may, however, perhaps be prevented by its being preserved in a state of domestication; as its flesh is excellent, and it is very easily domesticated, and breeds readily in that state. It has frequently bred in Britain. The eggs are six or seven in number, dark green; the male performs the principal part of the incubation. The eggs are highly esteemed as food. The skin of the emu contains much oil—six or seven quarts are obtained from a single bird, and on this account it has been much hunted in Australia. The food of the emu consists chiefly of roots, fruits, and herbage. Its only note is a drumming sound, which it frequently emits.

Emu, and Young.

EMU'LSIN, or **SYNAPTASE**, is a peculiar ferment present in the bitter and sweet almond, and which forms a constituent of all almond emulsions. When bitter almonds are bruised, and water added, the emulsin acts as a ferment on the amygdalin, and decomposes the latter into volatile oil of bitter almonds, prussic acid, grape-sugar, formic acid, and water (see ALMONDS, VOLATILE OIL, or ESSENTIAL OIL OF). The vegetable albumen of almonds is almost entirely composed of emulsin; which, when separated, is a white substance, soluble in water, and is distinguished by its remarkable power of causing the fermentation of amygdalin. It consists of carbon, hydrogen, nitrogen, and oxygen.

EMU'LSION is the term applied to those preparations in pharmacy obtained by triturating certain substances with water, and where the product is a milky white opaque mixture of a gummy consistence, and composed more or less of oily particles floating in mechanical suspension in the mucilaginous liquid. The *true* and *oily* emulsions are those containing true oil, as the emulsion of bitter almonds, obtained by bruising the latter in a mortar with water; and the *false*, or *not oily*, where no true oil is suspended, as where camphor, balsams, or resins are rubbed up with yolk of egg, mucilage, or dilute spirit of wine.

E'MYS, a genus of Marsh Tortoises, from which the whole family of Marsh Tortoises is sometimes called *Emydæ*. The chelonians of this family are numerous, and widely diffused throughout the warmer parts of the world. They differ more in their habits than in their appearance and structural characters from Land Tortoises. Their carapace, however, is more flattened, and their feet are more expanded and webbed, so that they swim with great facility. They feed chiefly on animal food, as insects and molluscs, aquatic reptiles, and fishes, some of them even preying upon birds and mammalia, which come within their reach. Two or three species of *Emydæ* are natives of the south of Europe; but two species are particularly abundant in North America, the Painted Tortoise (*Emys picta*), and the Alligator Tortoise (*Emysaura serpentina*). The flesh of some, as *Cistudo Europæa*, is esteemed for food. This small species, about ten inches long, an inhabitant of lakes, marshes, and muddy places in the south and east of Europe, is sometimes kept in ponds, and fattened for the table on lettuce-leaves, bread, &c.



Alligator Tortoise, in the act of seizing a Water Spaniel.

ENA'MEL (Fr. *émail*, originally *esmail*, from the same root as *smelt*), the name given to vitrified substances of various composition applied to the surface of metals. Enamelling is practised (1) for purposes of utility, as in making the dial-plates of watches and clocks, coating the insides of culinary vessels, &c., when it may be considered as belonging to the useful arts; and also (2) for producing objects of ornament and beauty—artistic designs, figures, portraits, &c., when it belongs to the fine arts. Both the composition of enamels and the processes of applying them are intricate subjects, besides being in many cases kept secret by the inventors; and we can only afford space for the most general indications of their nature. The basis of all enamels is an easily fusible colourless silicate or glass, to which the desired colour and the desired degree of opaqueness are imparted by mixtures of metallic oxides. The molten mass, after cooling, is reduced to a fine powder, and washed, and the moist paste is then usually spread with a spatula upon the surface of the metal; the whole is then exposed in a furnace (*fired*, as it is called) till the enamel is melted, when it adheres firmly to the metal. The metal most commonly used as a ground for enamel is copper; but for the finest kinds of enamel-work gold and silver are also used.

Artistic or Ornamental Enamelling.—This art is of great antiquity: it is proved by the remains found in Egypt to have been practised there; from the Egyptians it passed to the Greeks, and it was extensively employed in decoration by the Romans; in the reign of Augustus, the Roman architects began to make use of coloured glass in their mosaic decorations; various Roman antiquities, ornamented with enamel, have been dug up in Britain, and it was adopted there by the Saxons and Normans. A jewel found at Athelney, in Somersetshire, and now preserved in the Ashmolean Museum at Oxford, is proved by the inscription on it to have been made by order of Alfred; and there are various figures with draperies partly composed of coloured enamel on the sides of the gold cup given by King John to the corporation of Lynn, in Norfolk.

Enamelling has been practised from a remote period in the East, Persia, India, and China, under a separate and distinct development; but there is nothing from which it can be inferred that the various methods were in use earlier than in Europe. As a decoration, enamelling was more popular, and attained to greater perfection in the middle ages, than in classic times. It was extensively practised at Byzantium from the 4th until the 11th c., and afterwards in Italy in the Rhenish provinces, and at Limoges in the south of France, where it was successfully followed out till a comparatively late period, in several different styles. The Byzantine and other early styles of enamel-work down to the 17th c. were generally employed in ornamenting objects connected with the service of the church, such as reliquaries, pyxes, church-candlesticks, crosiers, portable altars, the frontals of altars, &c.; the art was also greatly used in ornamenting jewellery, and vessels made for use or display in the mansions of the rich, such as salt-cellars, coffers, ewers, plateaux, candlesticks, &c. After this period, the art declined, until a new phase of it was invented in France, in which enamel is used as a ground, and the figures are painted with vitrified colours on the surface of it. This is enamel-painting properly so called, the earlier styles being more of the nature of mosaics.

Distinguished with reference to the manner of execution, enamel-work may be divided into four kinds: 1. *Cloisonée*, or enclosed, the method of the Byzantine school, in which the design is formed in a kind of metal case, generally gold or copper, and the several colours are separated by very delicate filigree gold bands, to prevent them running into each other. 2. *Champ Levé*, practised by the early Limoges school. In this process, the ornamental design, or the figures that were to be filled in with colour, were cut in the metal (generally copper) to some depth; and wherever two colours met, a thin partition of the metal was left, to prevent the colours running into each other by fusion when fired. 3. Translucent enamel, which had its origin, and was brought to great perfection in Italy, was composed of transparent enamel of every variety of colour, laid in thin coatings over the design, which was incised on the metal, generally silver, the figure or figures being slightly raised in low relief, and marked with the graver, so as to allow the drawing of the contours to be seen through the ground, instead of being formed by the coarse lines of the copper, as in the early Limoges enamels. 4. Surface-painted enamels, which may be divided into two stages. The first stage, which is known as the *late Limoge* style, sprang up under Francis I. of France (1515—1547). In this the practice was to cover the metal plate with a coating of dark enamel for shadows, and to paint on this with white, sometimes set off with gold hatchings, sometimes having the hands and other parts of the figures completely coloured. The designs were generally taken from well-known paintings or engravings of the period; and the style of the designs was strongly influenced by that of the Italian artists employed by Francis I. This style soon degenerated, and gave place to the latest or *miniature* style, which was invented before the middle of the 16th c. by Jean Toutin, a goldsmith at Chateaudun, and carried to the highest perfection by Jean Petitot, a miniature-painter, who was born at Geneva, 1607, and afterwards resided long in England, and then in Paris. In this the plate is covered with a white opaque enamel, and the colours are laid on this with a hair-pencil, and fixed by firing. The paints are prepared by grinding up coloured enamels with some kind of liquid, and when fused by the heat, they become incorporated with the enamel of the ground. The earlier enamellers of this school occupied themselves with miniatures, snuff-boxes, and other trinkets, till the period of the French Revolution, when the art fell into disuse. It was, however, revived in England early in this century; and copies of portraits and pictures on a much larger scale than the French miniatures were executed with much success by the late H. Bone, R.A., and the late Charles Muss. Works of this description possess the obvious advantage of durability; but those various qualities of texture, and the delicacy of colour for which good works in oil or water-colour are prized, cannot be attained in enamel copies; and it is to be regretted that greater efforts are not made to turn enamelling to account in the way of ornamentation, for which it is so admirably fitted, rather than in attempts at imitating works classed strictly as within the bounds of fine art, and to put in practice the older styles of enamelling, particularly those denominated *champ levê* and transparent enamelling.

Enamelled-ware.—The liability of iron to oxidation by heat or moisture, and to corrosion even by the weakest acids, has led tó many attempts to coat it with a protecting surface. Ordinary tin plate is the oldest and most familiar example of a partially successful method. Since the beginning of the present century, many attempts have been made to cover iron with a vitreous surface, and several patents have been taken for such methods of enamelling. The chief difficulty in applying enamels to iron arises from the tendency of the metal to oxidise before it reaches the temperature at which the enamel fuses, and to become brittle from the oxide combining with the silica of the enamel. This action being superficial, the mischief is the greater in proportion to the thinness of the iron. Therefore it is much easier to enamel thick cast-iron vessels than thin vessels made of sheet-iron. A glass may be made by combining either silicic acid or boracic acid with a base; the latter fuses at a lower temperature than the former, but the glass is much dearer and not so durable as the silica glass. The enamels used for coating iron consist of a mixture of silica and borax, with various basic substances, such as soda, oxide of tin, alumina, oxide of lead, &c.

The best enamel for such purposes with which we are acquainted, is that patented by C. H. Paris, and applied by Messrs Griffiths and Browett of Birmingham. It consists of 130 parts of flint-glass powdered, 20½ parts of carbonate of soda, 12 of boracic acid. These are fused together to form a glass, then reduced to a very fine powder; the article to which they are to be applied is carefully cleaned with acid, then brushed over with gum water, and the powder dusted upon it. The gum water is merely to cause adhesion. This coating is then carefully dried, and heated just to the point at which the powdered glass will fuse, and by running together, coat the surface. Messrs Griffiths and Browett have succeeded completely in enamelling their 'hollow ware,' which is made of sheet-iron, stamped and hammered into the shape of saucepans, dishes, basins, &c., all in one piece, without any soldering.

Clarke's, and other patent enamels, have been successfully applied to saucepans, pipes, and other articles of *cast iron.* The writer has made many experiments upon enamelled-ware for laboratory and other purposes, and the conclusions arrived at are, that no enamelled-ware has yet been produced that will stand acids, or salts of metals that are electro-negative to iron; or will bear suddenly heating to a high temperature, such as frying-pans, for example, are commonly subjected to; but that with moderate care it may be used as saucepans and for boiling water, as dishes for baking, and may last for years. For vessels of any kind required to hold cold water, it is unobjectionable.

The action of sudden heat is to expand the metal more than the enamel, and cause the latter to peel off. Acids find their way through minute invisible pores, which exist in the best enamel; and when once they reach the iron, they rapidly spread between it and the enamel, and undermine and strip it off. This kind of action is curiously shewn by filling an enamelled vessel with a solution of sulphate of copper. The acid attacks the iron wherever pores exist, and little beads of metallic copper are deposited at all such spots; these beads go on growing until they are large enough to be very plainly seen. This is the severest test for trying the continuity of enamelled surfaces, to which they can be subjected, as sulphate of copper will penetrate the glaze and body of ordinary earthen-ware.

ENAMEL OF TEETH. See TEETH.

ENA'RA, or **ENA'RÉ,** a lake of Russia in the extreme north of Finland, is situated in lat. 68° 30′—69° 10′ N., and long. 27° 30′—28° 45′ E. It has an area of 1200 square miles, and has numerous islands. Its superfluous waters are discharged into the Arctic Ocean.

ENA'RËA, a country of Africa south of Abyssinia, is situated within lat. 7°—9° N., and long. 36°—38° E., but its limits have not yet been definitely ascertained. It is inhabited by a portion of the Gallas tribes, who, owing to the continued communication which they keep up with Abyssinia, and also to the residence of many Mohammedan merchants among them, are much more civilised than the Gallas usually are. Their government is a hereditary and absolute monarchy. The principal rivers of E. are the Gibbe and the Dodesa. Its coffee-plantations are so extensive as to deserve the name of woods; they occur chiefly along the banks of the Gibbe. E. is remarkable for its manufactures of ornamented arms, and of cloths with embroidered borders. Besides these, it exports slaves, gold, ivory, civet, and skins, into Abyssinia. The king and a small portion of the population are Mohammedans, and it is said that native Christians have been found here. The capital is Saka, a place of considerable importance, near the river Gibbe.

ENARTHRO'SIS is the term used by anatomical writers to express the kind of Joint (q. v.) which admits of the most extensive range of motion. From the mode of connection and the form of the bones in this articulation, it is commonly called the ball-and-socket joint. It occurs in the hip and shoulder joints.

ENCA'MPMENT (Lat. *campus*, a plain) is a lodgment or home for soldiers in the field. There are *intrenched* camps, where an army is intended to be kept some time, protected against the enemy; *flying* camps, for brief occupation; camps of *position*, bearing relation to the strategy of the commander; and camps of *instruction*, to habituate the troops to the duties and fatigues of war.

Under CAMP has been given an account of the manner in which Roman camps were constructed. It is probable that the same general plan was adhered to until the invention of gunpowder. When cannon came to be used, however, a new arrangement of camp became necessary, to shield the army from long-range projectiles. Everything, indeed, relating to attack and defence, especially to the latter, is taken into account in choosing the locality of a camp. A healthy site, good water, security from floods, and plenty of fuel and forage, are the chief requisites in a good encampment.

The British army, when in the field, usually encamps by brigades or divisions, roads and paths being arranged before the troops arrive. The infantry, cavalry, and artillery are so placed as to defend each other in the event of a sudden attack. There is a chain of guards all round the spot; and the park of artillery is placed behind the troops. The suttlers and servants are in the rear of the camp, but not beyond the limits of the rear-guard. The tents of the infantry are ranged in rows perpendicular to the front, each row containing the tents (q. v.) for one company. The circular tents, now much used, accommodate fifteen men each. The cavalry are in like manner encamped in rows; but each circular tent accommodates only twelve men. There are streets or roads between the rows of tents, of regulated width; and the officers' tents are at a given distance behind those of the men: the subalterns' tents being nearest to those of the companies to which they respectively belong. As a general rule, the line of the whole encampment is made to correspond as nearly as practicable with that in which the troops are intended to engage the enemy when fighting is renewed; to which end the tents of each battalion are not allowed to occupy a greater space in front than the battalion itself would cover when in order of battle.

Under most circumstances, in modern warfare, an encampment is not defended by artificial constructions; the commander seeks security for his troops in streams, marshes, difficult surface of country, and numerous advanced posts. Sometimes, however, more extensive defence-works are necessary; and then we have an example of an *intrenched* camp, which becomes a fortified enclosure. The chief uses of such a camp are—to secure an army while covering a siege, or in winter-quarters, to accommodate a corps of observation while the active army is engaged elsewhere; or to defend a position near a fortified place. Care is taken that the site is not commanded by neighbouring hills. All villages are occupied, and all obstacles removed, within a distance of half a mile or a mile. The area of ground selected is large enough to contain the necessary store of arms, ammunition, food, fuel, forage, and water, and to enable the troops to manœuvre. The junction of two rivers is often selected as a favourable spot. Various defence-works are constructed around or near the spot, such as continuous earth-works, redoubts, flèches, &c. The position held by the allies outside Sebastopol, during the long intervals when the cannonading was suspended, had many of the characteristics of an intrenched camp.

Camps of *instruction* may be either temporary or permanent. Of the former kind was the camp formed at Chobham in Surrey in 1853, merely for the summer months, to exercise certain regiments in evolutions. Another was formed at Shorncliffe in Kent in 1855, at first to receive troops of the Foreign Legion; but it has since been improved to the condition of a permanent camp. The great establishment at Aldershott is described in a separate article, ALDERSHOTT CAMP. Since that article was written, the total expenditure has risen to nearly a million sterling, the camp has been improved in all particulars, and the small agricultural village of Aldershott has grown into an important commercial town, with railway stations, hotels, market-house, handsome shops, &c. A large permanent camp has also been established in Ireland, on a plain called the Curragh of Kildare, and there are smaller ones at Pembroke and Colchester.

ENCAU'STIC PAINTING (Gr. *encaustikē*, infired, or fixed by fire), a manner of painting practised by the ancients. As the name implied that fire was used in the execution, some have been led to suppose that encaustic painting was the same as enamel painting; but notices by Pliny and other writers shew clearly that it was a species of painting in which the chief ingredient used for uniting and fixing the colours was wax dissolved by heat. Various attempts have been made in modern times to revive it. About the middle of last century, Count Caylus and M. Bachelier, and in 1792, Miss Greenland, made various experiments with this view. The count laid the result of his experiments before the Academies of Painting and of Sciences in Paris; and the ingenious lady was rewarded with a gold pallet by the Society for the Encouragement of Arts in London; but the success of these efforts seems to have been but temporary. Encaustic painting was, however, some years ago again taken up in Germany under the patronage of the late king of Bavaria, who had a number of important works executed in this way. The colours are ground, and laid on with a vehicle composed principally of wax. Miss Greenland dissolved gum-arabic in water, afterwards adding gum-mastic, which was dissolved by stirring and boiling, and when the mixture had reached the boiling point, she put in the wax. After painting the picture, she passed a thin coating of melted wax over it with a hard brush, and then drew over the surface an iron—for ironing linen—moderately heated. After the picture cooled, it was rubbed with a fine linen cloth. The German method is somewhat similar, but some other ingredients are used; among these, potash with the wax; and in place of an iron being passed over the surface, the wax is brought to the surface by a vessel containing fire being held at a little distance from the picture. Encaustic painting is not likely to come into general use, for neither in imparting brilliancy to the colours, facility for execution, nor durability, is it to be compared with oil-painting.

ENCAUSTIC TILES, ornamental tiles made of an earthen-ware intermediate in quality between common tiles and porcelain, and now extensively used for paving churches, halls, conservatories, &c. They are of two kinds—plain or 'dry tiles,' and figured tiles. The former are square or triangular, and of different colours, so that when laid they may form a mosaic. The triangular are most effective; and by means of a few colours, a great variety of chromatic geometrical patterns may be produced. These 'dry tiles' are made by placing the coloured clay in a powdered state in strong steel moulds, and subjecting it to a pressure of several hundred tons, by means of a plunger fitting accurately into the mould. A depth of three inches of powder is compressed into a tile of one inch in thickness. The bottom of the mould is usually ribbed, to give the tile a corresponding surface, in order to afford a better hold for the mortar. The compressed clay is then removed, heated in a hot chamber, fired, and glazed if required. Slabs and panels of various kinds, shirt studs and buttons, and a variety of ornamental articles, are made in this manner. See POTTERY and PORCELAIN.

The figured tiles are made in a different manner. The clay is worked in a moist state, but very stiff, first into square blocks. These are cut into square slices or slabs by passing a wire through them; upon this is put a facing of fine clay of the colour of the ground of the pattern—another layer, of a different quality of clay, is sometimes added to the bottom, to prevent warping. It is then placed in a mould, with a plaster of Paris slab forming the top, on the under surface of which is the pattern in relief. This slab is pressed down, and thus forms a deep impression of the pattern which is to be produced in another colour. The clay of the requisite colour to form the pattern is now poured, in a semi-fluid state, into this depression, and allowed to flow over the whole face of the tile; then it is set aside until dry enough to have its surface scraped and smoothed on a whirling table. By this means, the superfluous clay is removed, and the pattern is brought out quite sharp, the two colours of clay forming one smooth flat surface. The tile is then dried and fired.

Tiles of this kind were used for paving churches in England, Flanders, and France, in the 16th c., and earlier, but have since fallen into disuse. The modern manufacture is therefore a revival, with some improvements, of an ancient art. This is one among many other branches of manufacturing art which the Great Exhibition of 1851 had much influence in advancing, first, by stimulating manufacturers to make an effort to shew what could be done, and secondly, by directing public attention to the novelty and its applications.

ENCEINTE (Fr.), in Fortification, denotes generally the whole area of a fortified place. Properly, however, it means a cincture or girdle, and in this sense the *enceinte* signifies the principal wall or rampart encircling the place, comprising the curtain and bastions, and having the main ditch immediately outside it.

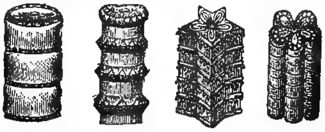
ENCHO'RIAL CHARACTERS. See HIEROGLYPHICS.

E'NCKÉ, JOH. FRANZ, the well-known astronomer, was born September 23, 1791, at Hamburg, where his father was a clergyman. After studying at Göttingen, he served, during the campaign of 1813—1814, in the artillery of the Hanseatic legion, and in 1815, in the Prussian army, as lieutenant of artillery. On the establishment of peace, he left the service, and became assistant, and afterwards principal astronomer in the observatory of Seeberg, near Gotha. In 1825, chiefly at the instigation of Bessel, he was called to Berlin as successor to Tralles, in the secretaryship of the Academy of Sciences, and as director of the observatory. While at Gotha, the astronomical prize offered by Cotta was awarded to E. by the judges Gauss and Olbers, for his determination of the orbit of the comet of 1680. This led him to solve another problem, which had been proposed along with the other—viz., the distance of the sun. The solution, by means of the two transits of Venus in 1761 and 1769, is published in two separate tracts (*Die Entfernung der Sonne*, Gotha, 1822—1824). In 1819, he proved that the comet discovered by Pons, November 26, 1818, revolved in the hitherto incredibly short period of about 1200 days, and had been already observed in 1786, 1795, and 1805. It has since gone by the name of E.'s comet, and has appeared regularly; the period of its recurrence being 3·29 years, or about $3\frac{3}{10}$ years. See COMETS. E.'s researches on this subject are contained in the *Transactions of the Berlin Academy.* In 1830, he undertook the editing of the Berlin *Astronomical Almanac*, in which he has published a number of astronomical treatises. Three volumes have appeared of *Astronomical Observations at the Berlin Observatory* (Berl. 1840—1851).

ENCORE ('Again'), a French expression, generally used in England by the audience of a theatre or concert-room, when requesting the repetition of the performance of a piece of music. It is not used by the French themselves, who, in similar circumstances, exclaim *bis* (twice).

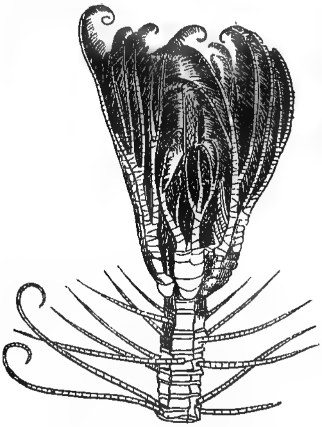
ENCRI'NAL or **ENCRINI'TAL LIMESTONE,** a name given to some carboniferous limestones, from the great abundance in them of the calcareous skeletons of Encrinites (q. v.), whole masses of the rock being almost entirely composed of them.

E'NCRINITES, a name applied generally to the fossil Crinoidea, a family of Echinodermata (q. v.). The popular name, *Stone Lilies*, is given to the numerous fossil species, from the resemblance which many of them present when the rays are closed to the lily. Hence also the name Crinoidea. Crinoids are characterised by having their bodies supported, during the whole or part of their existence, on a longer or shorter jointed calcareous stem. The stem is attached either by the expanded base, or by jointed processes, to the rocky bed of the sea, or perhaps, in some cases, to floating bodies, like barnacles. Occasionally, numerous root-like side-arms are sent out from the base of the stem to strengthen and support it; and in some species, as in the recent *Pentacrinus*, the column throughout its length is furnished with axillary side-arms. The stem is round or five-sided; in one genus only is it elliptical. It is composed of a number of joints, perforated in the centre, for the passage of a soft portion of the animal, and beautifully sculptured on the articulating surfaces. The body is cup-shaped, and composed of many-sided plates on the under surface, to the centre of which the stalk is attached, while the upper surface is covered with a coriaceous skin, protected by many small plates. On this was situated the mouth, which was frequently proboscidiform, and near it was the anal orifice—the alimentary canal being turned upon itself, as in the Bryozoa. The arms spring from the edges of the cup. They are five in number at their origin, but, with few exceptions, speedily divide and subdivide dichotomously. The arms are composed of articulated calcareous joints, similar to those of the stems. Each joint is furnished with two slender-jointed appendages or cirri, of use to the animal in capturing its prey, which consisted of mollusca and other small animals. The number of joints in some species is truly amazing. Dr Buckland calculated that *Pentacrinus Briareus* consists of at least 150,000; and 'as each joint,' according to Carpenter, 'was furnished with at least two bundles of muscular fibre—one for its extension, the other for its contraction—we have 300,000 such in the body of a single *Pentacrinus*, an amount of muscular apparatus far exceeding anything that has elsewhere been observed in the animal kingdom.'



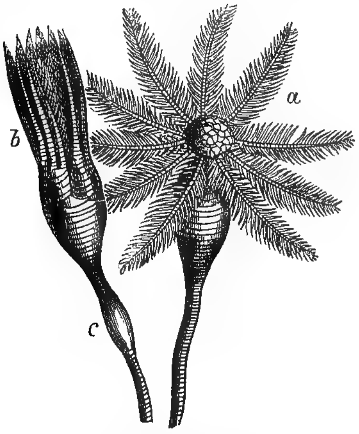
Encrinite Stems (Mountain Limestone).

E. are represented in the British seas by one species, *Comatula rosacea*, which in its perfect state is free, and moves about in the same manner as other star-fishes, but is in its structure a true crinoid, and, in fact, when young, has the flexible stalk characteristic of the order. It is doubtful whether more than one species (*Pentacrinus Caput Medusæ*) of permanently stalked E. lives in modern seas. It is a native of the West Indian seas.



Pentacrinus Caput Medusæ.

The family commenced its existence with the earliest sedimentary deposits. Seventy-three genera have been described, containing upwards of 300 species, two-thirds of which are found only in Palæozoic rocks. The most ancient E. have nearly all round stems, the few that are five-sided having the articulated surface of the joints simply radiated, and not complexly sculptured as in Pentacrinus, the type of a division of the order which appears first in the Lias. The earlier seas literally swarmed with these animals. 'We may judge,' says Dr Buckland, 'of the degree to which the individual crinoids multiplied among the first inhabitants of the sea, from the countless myriads of their petrified remains which fill so many limestone beds of the older formations, and compose vast strata of entrochal marble, extending over large tracts of country in Northern Europe and North America. The substance of this marble is often almost as entirely made up of the petrified bones of Encrinites, as a corn-rick is composed of straws.' See Crinoideæ and Pentacrinus.



Apio Crinites Rotundus (from Buckland's *Bridgewater Treatise*).

a, expanded; *b*, closed; *c*, shewing where the stem has been injured, and repaired by calcareous secretion.

ENCYCLOPÆ'DIA means properly a book or work professing to give information, more or less full, on the whole circle of human knowledge. The name is compounded of two Greek words, *enkyklios*, circular or general; and *paideia*, discipline or instruction. These words were used by the Greeks and Romans to signify the circle of instruction through which every free-born youth had to pass before entering on public life. That circle embraced more particularly grammar, music, geometry, astronomy, and gymnastics, and afterwards became the 'seven liberal arts' of the middle ages. The compound name Encyclopædia appears to have been unknown to the Greeks, and also to the Latin writers of the classic period; and there is no evidence that either Greeks or Romans ever applied the words, single or compounded, to designate a book. The short form *Cyclopædia* has still less classical authority than Encyclopædia.

Encyclopædias, in the modern sense of the word, are most commonly Alphabetical; but sometimes the arrangement is 'rational,' i. e., according to the natural relations of the subjects. An alphabetical Encyclopædia is a Dictionary of Universal Knowledge. Besides this, its proper meaning, of a repertory of universal knowledge, the name Encyclopædia is often applied—less properly perhaps—to alphabetical works whose scope is limited to a particular branch—works differing in no respect from others which are styled Dictionaries, Gazetteers, &c. See Dictionary. As all works of this kind, which now form a large and increasing section of literature in every language, have in so far a common character with Encyclopædias proper, we may give some account of the whole class under the present head.

For the sake of convenience, they may be arranged in three divisions: 1. The earlier works of this kind, having, for the most part, merely an encyclopædic character, i. e., embracing a large range of subjects, without distinctly aiming at universality; 2. Encyclopædias proper, which treat of the whole circle of human knowledge; 3. Books professedly confined to a definite department of knowledge, whether under the name of encyclopædia, dictionary, gazetteer, or other title. As books of this class profess to touch on every important point that comes within their scope, they may be considered as encyclopædic in a limited sense. In the following sketch, the distinction between the first and second of those classes, which is of a somewhat indeterminate kind, is not strictly adhered to when it would interfere with the chronological sequence.

1. The earliest work of an encyclopædic character is generally ascribed to Speusippus, a disciple of Plato. The great collections of Varro (*Rerum Humanarum et Divinarum*, *Antiquitates* and *Disciplinarum libri* ix.), of the elder Pliny (*Historia Naturalis*), of Stobæus, of Suidas, of Isidorus (the *Origines*), and of Capella, belong to the same class, but they exhibit no plan, and are only confused accumulations of the then known arts and sciences. Vincent of Beauvais (1264) surpassed them all. He gathered together with wonderful diligence the entire knowledge of the middle ages in three comprehensive works, *Speculum Historiale, Speculum Naturale,* and *Speculum Doctrinale,* to which soon after an unknown hand added a *Speculum Morale.* But these, as well as the other similar compilations which appeared in the later medieval period under the title of *Summa*, or *Speculum* (Mirror), are marked throughout by a lack of philosophic spirit. Perhaps the nearest approach to the modern encyclopædia by an ancient writer, dates two centuries earlier than the time of Beauvais. In the tenth century, flourished Alfarabius, the ornament of the school of Bagdad, who wrote an encyclopædic collection of

knowledge, remarkable for its grasp and completeness, and which still lies in MS. in the Escorial of Spain. Among the earliest and most noted of the modern encyclopædias was that of Johann Heinrich Alsted, or Alstedius, which appeared in Germany in two volumes in 1630. It consisted of 35 books in all, of which the first four contained an explanation of the nature of the rest. Then followed six on philology, ten on speculative, and four on practical philosophy; three on theology, jurisprudence, and medicine; three on the mechanical arts; and five on history, chronology, and miscellaneous topics. Two important French works belong to this century—the one is Louis Moreri's *Grand Dictionnaire Historique et Critique*, of which the first edition appeared at Paris in 1673, and the last in 1759; the other, Peter Bayle's famous *Dictionnaire Historique et Critique*, published at Rotterdam, in 4 vols., 1697. The first encyclopædic *dictionary*, so far as known, appeared in Germany as the *Lexicon Universale* of Hoffmann (2 vols., Basel) in 1677. Some time after there appeared in France Thomas Corneille's *Dictionnaire des Arts et des Sciences*, 2 vols. (Paris, 1694). Dictionaries limited to the explanation of technical terms had long been common throughout Europe; but previous to Hoffmann's work, no attempt had been made to bring the whole body of science and art under the lexicographic form. A highly successful attempt identical in kind, and attributable in idea, it may be, to the German work just alluded to, was the *Lexicon Technicum* of Dr Harris, 2 vols. folio (London, 1710), which may fairly be regarded as the parent of all the dictionaries of arts and sciences that have since appeared in England. The *Cyclopædia* of Ephraim Chambers, published in 1728, in two very large folio volumes, presents the next marked advance in the construction of encyclopædical dictionaries. This one was brought out with considerable claims to originality of arrangement. The author endeavoured to communicate to his alphabetical materials something of the interest of a 'continuous discourse,' by an elaborate system of cross references. Another peculiarity of this cyclopædia was, that its author, in the details of mathematical and physical science, gave only conclusions and not processes of demonstration. It was long a very popular work. The largest and most comprehensive of the successors to Hoffmann's book in Germany, was Zedler's *Universal Lexicon*, 64 vols. (Leip. 1732—1750). In point of comprehensiveness, this work should be classed with the encyclopædias proper, there being almost nothing then known that may not be found in it. Perhaps the strongest impulse, if not in all respects the best, communicated by this successful attempt of Ephraim Chambers, was given to the French mind through D'Alembert and Diderot. Their *Encyclopédie* was really, though not professedly, founded upon E. Chambers's book, which an Englishman named Mills had translated between 1743 and 1745, though the French version of it never was published. The great French *Encyclopédie* was written by various authors of high literary and philosophical attainments, but of whom nearly all were tainted too much with the most impracticable revolutionary ideas, besides holding for the most part extremely sceptical opinions concerning religion. They excluded both biography and history from its scope, yet infused into it more originality, depth, and ability than ever had appeared before within the boards of an encyclopædical dictionary. It appeared at Paris in 28 vols. between the years 1751—1772, and was followed by a Supplement in five vols. (Amst. 1776—1777), and an analytical index in two vols. (Paris, 1780). The work was everywhere received with the greatest enthusiasm, and it secured a place in the literary history of the nation for the editors and principal writers, who are ordinarily known as the *Encyclopédists* of France. They were D'Alembert and Diderot the editors, Rousseau, Grimm, Dumarsais, Voltaire, Baron d'Holbach, and Jancourt. [See La Porte's *Esprit de l'Encyclopédie* (Paris, 1768); and Voltaire's *Questions sur l'Encyclopédie* (Paris, 1770).] D'Alembert's celebrated preliminary discourse was garbled in various pretentious works of this class published for the most part in England; such were Barrow's *New and Universal Dictionary of Arts and Sciences*, 1 vol. folio, 1751; and the *Complete Dictionary of Arts and Sciences*, by Croker, Williams, and Clerk, 3 vols. folio, 1766. A somewhat better, though rather illogical performance was published by a 'Society of Gentlemen' in 1754 in four 8vo volumes, generally known as *Owen's Dictionary*, from the name of the publisher of it. The first rude outline of the ponderous and solid *Encyclopædia Britannica* was laid down in the year 1771, in three volumes, but it was nothing more than a dictionary of arts and sciences; it had not yet attained to its subsequent universality. Such is a brief outline of the earlier kind of encyclopædias.

2. The first encyclopædia proper that demands our attention is the *Encyclopædia Britannica*, of which the 2d comparatively complete edition, containing biographical and historical articles, appeared in 10 vols. between 1776 and 1783; the 3d edition was completed in 18 vols. in 1797; the 4th edition, in 20 vols., in 1810; the 5th and 6th editions (which were not true reprints), and supplements in 6 vols., appeared between 1815—1824; the 7th edition, in 21 vols., in 1830—1842; and the 8th and last edition, in 21 vols., 1852—1860. The method pursued by this work, while thoroughly alphabetical, consists in a combination of the systematic and the particular. In few instances is any science broken up into fractional parts; nearly all the sciences are given in treatises as they severally occur in the order of the alphabet. In some cases, however, where obscurity might result from such a plan, the other method is adopted. A marked feature of this work, is the number of complete treatises and dissertations which it contains by men of European name. From first to last, this Encyclopædia has been executed and published in Edinburgh, the literary reputation of which it has helped in no small degree to increase. The next encyclopædia that we must notice is the *Encyclopédie Méthodique par Ordre des Matières*, which was begun in 1781, and was not finished till 1832, when it appeared in 201 volumes. Each subject is treated in a separate volume or series of volumes, so that the work is a collection of separate dictionaries, more extensive than any encyclopædic work that has yet appeared. A work of higher scientific value, however, and even of a more varied nature, has been in progress for nearly half a century in Germany, undertaken originally by Professors Ersch and Gruber in 1818, and which has since continued to appear, in three several sections of the alphabet, up to the present time. There have already (1861) appeared of this great *Allgemeine Encyclopädie der Wissenschaft und Künste* some 125 volumes. In 1802, Dr Abraham Rees projected an extended and improved edition of Ephraim Chambers's *Cyclopædia*, which was completed in 45 volumes in 1819. The system of cross references peculiar to E. Chambers is very effectually carried out in this book; but besides including a great accession of historical and biographical detail, it contained a large number of papers, prepared by competent writers, on subjects

with which their life had rendered them familiar. Another work of considerable merit, which began to appear in 1810, was Brewster's *Edinburgh Encyclopædia*, edited by Dr (now Sir David) Brewster, and completed in 18 volumes in 1830. It was, if anything, too much given up to physical science, even for the taste of the 19th century. In 1812, a great impetus was given to encyclopædic publications by the appearance of the *Conversations-Lexicon* of F. A. Brockhaus of Leipsic. It has since gone through as many as *ten* editions, the last issue of it, amounting to 15 volumes, having appeared between 1851 and 1855. It has been translated into nearly all the civilised languages of Europe; no fewer than *four* English works of the kind being professedly founded on it: these are the *Encyclopædia Americana*, in 14 vols. (Philadelphia, 1829—1848); the *Popular Encyclopædia*, 7 vols. (Glasgow, 1841); the *American Cyclopædia*, and Chambers's *Encyclopædia*, both in course of publication. Of these, the last-mentioned is a substantially new work, following in its construction the admirable plan of the *Conversations-Lexicon*, but making use of its valuable matter only so far as it is found suitable.

The next encyclopædic work which appeared after the *Conversations-Lexicon*, was one projected according to an original philosophic plan by Samuel Taylor Coleridge, in 1818, and finished in 1845, in 30 volumes. This *Encyclopædia Metropolitana* was arranged in four divisions: 1st, the pure sciences; 2d, the mixed and applied sciences; 3d, biography and history; and 4th, miscellaneous and lexicographic articles. The contributions to the first two divisions were written by persons of recognised ability, and they have nearly all been published separately in 8vo volumes since the *Metropolitana* appeared. If the book had any fault, it was that the plan of it was too rigidly philosophical, and therefore not adapted to be consulted dictionary fashion; for although in one sense the alphabetic arrangement, by its jumble of subjects, is most heterogeneous and irrational, it recommends itself to popular acceptance by its extreme simplicity; and in point of fact, no encyclopædia has ever been thoroughly popular that has not been executed on the plan of a single alphabet, in which all subjects, however various, are included. Next appeared the *Penny Cyclopædia* of the Society for the Diffusion of Useful Knowledge, which was begun in 1833, and completed in 1843, in 28 volumes. This work was perhaps, at the time it appeared, the most useful and convenient, for the purposes of general consultation, of any encyclopædical treatise that had ever been issued. The *English Cyclopædia* is founded on the copyright of the *Penny Cyclopædia*, but is rearranged into four great divisions, which are each given in the order of the alphabet, viz., geography, natural history, biography, and arts and sciences. This publication was begun in 1853, and was completed in 1861 in 22 volumes. Among a host of abridgments and smaller publications of this character which have appeared in the course of the present century, may be mentioned Wilkes's *Encyclopædia Londonensis*, in 24 vols. 4to (Lond. 1810—1829); the *Encyclopædia Perthensis*, in 23 vols. (Edinburgh, 1816); and the *London Encyclopædia*, 22 vols. (Lond. 1829). The French have likewise published an *Encyclopédie des Gens du Monde*, in 22 vols. 8vo (Par. 1833—1844); an *Encyclopédie Moderne*, which, with its Supplement, occupies 36 vols. 8vo (Par. 1857); and a *Dictionnaire de la Conversation et de la Lecture*, in 68 vols. (Par. 1839—1851), of which a new edition, begun in 1851, is still in progress. The last of these is to a large extent based on the *Conversations-Lexicon* of Brockhaus. The most notable of the other German encyclopædias are Meyer's *Grosse Conversations-Lexicon*, in 38 vols., 1840—1852, besides 6 volumes of a Supplement and 8 volumes of plates, &c., in 1853—1855; and Pierer's *Universal Lexicon*, in 34 vols. (Altenburg, 1840—1846), a new and improved edition of which began to appear in 1851. In addition to these, there are at present (1861) several encyclopædias in course of publication in other European countries; all of which are based upon the *Conversations-Lexicon*—viz., the *Enciclopedia Española*, begun at Madrid in 1842; the *Nuova Enciclopedia Popolare Italiana*, begun at Turin in 1856; the *Almenn. Dansk Konversations-Lexicon* (Copenhagen, 1849); and the *Svenskt Konversations-Lexikon*, begun at Stockholm in 1845; besides others in Russia, Hungary, the Netherlands, &c.

3. We have now to direct attention briefly to those books that are *dictionaries* or encyclopædias for one branch of knowledge. These works have been always very numerous, both in this country and on the continent. Such are the *Biographie Universelle* (commenced in 1811; new edition, 1854, still going on); Chalmers's *Biographical Dictionary*, in 32 vols. (1812—1817); the *Dictionnaire des Sciences Médicales*, 60 vols. (Par. 1812—1822); *Nouveau Dictionnaire d'Histoire Naturelle*, 36 vols. (Par. 1816—1819); F. Cuvier's *Dictionnaire des Sciences Naturelles*, 61 vols. text, 10 vols. plates, (1816—1845); *Dictionnaire de l'Industrie*, &c., 10 vols. (Par. 1831—1841); M'Culloch's *Commercial Dictionary* (2d edition, 1834; last edition, 1859); M'Culloch's *Geographical Dictionary* (1st edition, 1841; new edition, 1851); the *Dictionary of Practical Medicine*, 3 vols. (Lond. 1844—1858); Chambers's *Cyclopædia of English Literature* (1843; new edition, 1858); Creasy's *Encyclopædia of Civil Engineering* (1847); Johnston's *Gazetteer* (1850; new edition, 1859). Morton's *Cyclopædia of Agriculture*, 2 vols. (1851); the *Nouvelle Biographie Générale* (begun in 1853, and still going on); Lippincott's *Gazetteer of the United States* (Philadelphia, 1854); Lippincott's *General Gazetteer* (1855); Allibone's *Dictionary of British and American Authors* (Philadelphia, 1859); Macaulay's *Medical Dictionary*, 1 vol. (Edinburgh, 1859); and Schmid's *Encyclopädie des Gesammten Erziehungs-und Unterrichtswesen* (1859). Nor must we overlook the dictionaries of Dr William Smith, viz., the *Dictionary of Greek and Roman Biography and Mythology*, 3 vols. (1843—1848; new edit. 1849—1851); the *Dictionary of Greek and Roman Antiquities*, 1 vol. (1848); the *Dictionary of Greek and Roman Geography*, 2 vols. (1854—1857); and the *Dictionary of the Bible*, 2 vols. (1860—1861). These dictionaries are the product of the ripest scholarship in Britain, and are perhaps the most splendid specimen of encyclopædias devoted to special branches of knowledge that have anywhere appeared. See DICTIONARY.

ENCYCLOPÉDISTS. See ENCYCLOPÆDIA.

END. This familiar word is concerned in some important discussions, and especially in Ethics. It is in the sense of 'the thing aimed at,' the object, purpose, or goal of human action, that we have here to consider it. There is a fundamental contrast between Science and Art, Knowledge and Practice. Science, or Knowledge, embraces the general order of the universe, and states that order in the form by which we can take in as much as possible in one view; it is the fullest intellectual comprehension of the phenomena of nature that the mind can attain to. Art, or Practice, on the other hand, selects and appropriates certain items of knowledge, so as to subserve some useful purpose, some exigency of human life. Thus, Agriculture, Navigation, Law, Politics, Education are all branches of Practice;

they involve knowledge, but in strict subordination to their several purposes. The navigator studies Astronomy, not with a view to enlighten his understanding as to the mysteries of the solar system and the starry sphere, but with a view to the guidance of his course in the sea. In short, to an Art (the word is not here used in the narrow sense of a Fine Art), or a department of Practice, belongs in the first place the consideration of the *end.* Every Art has its end, which is its distinction from every other. In most of the arts, the end is clear and unmistakable: we all know what is expected of a builder, a soldier, or a judge; the only question is how to obtain the knowledge requisite for adequately performing each separate function. But there are some departments where the end itself is not agreed upon, which casts a peculiar difficulty on the practice. Thus, it was remarked under CIVILISATION, that the end of the whole mechanism of Human Society, including Politics, &c., is differently viewed by different minds. But it is in the one special Department of Morality that the consideration of the end is of most vital consequence. This feature of the ethical problem has been very little adverted to in modern discussions, while the ancient philosophers kept it more prominently before them. Aristotle begins his *Ethics* by remarking that every art aims at some good; most arts, as medicine, ship-building, generalship, having limited or partial ends; while some comprehend much wider ends than others. The largest end of all is the good of mankind collectively. Hence he goes on to inquire what is the highest good of man, and finds that happiness is neither Pleasure, nor Honour, nor Virtue (by itself), nor Wealth, but that it is 'an energy of the soul according to virtue;' activity, in opposition to Oriental notions of luxurious repose, being an essential in his eyes. He has next, therefore, to inquire what 'virtue' is, according to which a man must employ his activity—a question of no easy solution. Still, the discussion brings out the one fact, that Morality is a branch of Practice, but unlike most arts in this, that the end is peculiarly difficult to determine precisely. Accordingly, it is necessary to have in connection with it a set of discussions, called by Mr J. S. Mill (*Logic*, concluding chapter) Teleology, or the Doctrine of Ends, corresponding to what the German metaphysicians have termed the Principles of Practical Reason. The various theories of Moral Obligation differ in their statement of the end of Morality: according to one, it is the self-interest of the individual; according to another, the interest of mankind on the whole. The most prevalent theory is the harmonising with a certain inward sentiment called the Moral Sense. See ETHICS.

ENDE'MIC (from *en*, among, and *dēmos*, the people), a term applied to diseases which affect numbers of persons simultaneously, but so as to shew a connection with localities as well as with their inhabitants. Endemic diseases are usually spoken of as contrasted with Epidemic (q. v.) and Sporadic (q. v.); the first term indicating that a disease infests habitually the population within certain geographical limits, and also that it is incapable of being transferred or communicated beyond those limits; while, on the other hand, a disease is termed epidemic if it is transmitted without reference to locality; and sporadic if it occurs in isolated instances only. The theory, accordingly, of endemic diseases is, that they are in some way or other connected with the soil—the result of terrestrial influences, or *miasms*—of poisons generated within the earth, or near its surface, and diffused through the air, so as to be weakened in proportion to the distance from the source of the poison. Such poisons are always observed to be more virulent in summer than in winter—more dangerous at night, when the vapours are concentrated on the surface of the soil, than in the day-time—more abundant in the plains, and in close confined places, than at a certain degree of elevation—more easily carried in the direction of the wind than in the opposite—and very often arrested altogether by water, or by a belt of forest or other luxuriant vegetation. In all these particulars, *endemic* are different from *epidemic* diseases, which bear no very obvious relation to the soil, and are not observed to be considerably modified either by the prevailing winds or the period of the day or night at which exposure to their influence takes place. The most marked type of an endemic disease is Ague (q. v.) or Intermittent Fever, which has all the habits mentioned above, and is to so marked a degree a denizen of particular tracts of country as to lead to their being in some instances almost depopulated. Many places in Italy are a prey to the *aria cattiva* or *malaria*, as it is popularly called; and hence, no doubt, even more than for protection from human foes, the custom so prevalent in that country of building the villages on the tops of hills, so as to secure immunity from the poisonous vapours raised by the solar heat from the plains lying on either side at the base of the Apennines. Terrestrial *miasms*, or such poisons as generate endemic diseases, are usually found in the neighbourhood of marshy flats, or of uncultivated tracts of land at the confluence of rivers, or where a *delta*, or a wide channel subject to overflow, is formed at the upper end of a lake. In proportion, too, as the heat of the sun is greater, the tendency to malarious emanations is increased; and in the tropics, accordingly, large tracts of jungle and forest are often rendered absolutely uninhabitable and almost impassable at certain seasons, by the invisible and odourless germs of intermittent, remittent, and even continued Fevers (q. v.), which are more fatal and unmanageable than the most terrible epidemic pestilences to those who are exposed to them. Such diseases are almost always sudden in their mode of attack, and they indicate the range of their influence by the number of persons attacked; but they are wholly free in most cases from the suspicion of communication by Contagion (q. v.), which is so frequent in the case of epidemic diseases. The precise nature of the malarious poison has never yet been discovered with any approach to exactness. It is known, however, to be almost invariably checked by drainage and cultivation of the soil; and hence many places in Europe, formerly very productive of endemic diseases, have now ceased to be so, as in the case of the Tuscan Maremma, and some parts of Kent and Essex, and of the Lothians in Scotland.

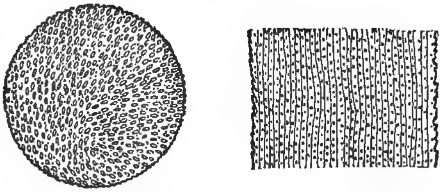
E'NDERBY LAND, discovered by Biscoe in 1831, lies in lat. 67° 30′ S., and long. 50° E. It appeared to the discoverer to be of considerable extent, and was closely bound by field ice, but owing to stress of weather and the extreme cold, it could not be approached within 20 or 30 miles, and Biscoe was thus unable to say whether the land he discovered was an island or a strip of continental coast.

E'NDIVE (*Cichorium Endivia*), an annual or biennial plant, of the same genus with Chicory (q. v.), said to be a native of China and Japan, but which is naturalised in the Levant, and has long been in cultivation as a garden vegetable; its blanched root-leaves being much used as a salad.

and also sometimes for stewing and in soups. The root-leaves are numerous, smooth, wavy at the margin. The varieties with much curled leaves are preferred. Some of the varieties *boll* of themselves, and are thus blanched; others require to be tied up. In Britain, the seed is usually sown from the middle of May to the end of June, and by a little care and protection, plants may be kept fit for use throughout most of the winter.

ENDOCARDI'TIS, inflammation or disease of the internal surface of the heart, resulting in the deposit of fibrin upon the valves. See HEART, DISEASE OF.

ENDO'GENOUS PLANTS, or **ENDOGENS** (Gr. *endon*, within, and *genos*, birth or origin), one of the great classes into which the vegetable kingdom is divided, the others receiving the corresponding designations of *Exogenous Plants* and *Acrogenous Plants*. The character from which this designation is derived is found in the structure of the stem, which does not increase in thickness by additional layers on the outside like the *exogenous* stem, familiarly illustrated in all the trees of the colder parts of the world, but receives its additions of woody matter in the interior; and in general does not continue to increase indefinitely in thickness like the exogenous stem, but is arrested when a certain thickness has been attained, different in different species, and afterwards increases only in length. When a transverse section is made of an endogenous stem, numerous bundles of vessels are seen dispersed irregularly in cellular tissue, the younger and softer parts of the stem exhibiting the cellular tissue in greatest proportion, the older and lower parts chiefly abounding in vascular bundles, which are, however, somewhat scattered in the central part of the stem, and are densely aggregated towards the circumference, there, in the palms generally, forming very hard wood, in some of them wood so hard that it cannot be cut with a hatchet. The stems of endogenous plants in the far greater number of cases produce terminal buds only, and not lateral buds, and are therefore unbranched. From the bases of the leaves, definite bundles of vascular tissue converge towards the centre; but these extending downwards extend also outwards, and thus an interlacing of fibres takes place, which contributes not a little to the strength and compactness of the wood in the lower part of the stem. As the fibres extend downwards, they also become attenuated, spiral and porous vessels disappearing, and nothing but the most ligneous substance remaining. It is the hardening of the outer part of the stem which arrests its increase in thickness. Endogenous stems have not a distinct *pith*, nor any *medullary rays*. When the central part is soft and pith-like, yet it is not distinctly separated from the surrounding wood, and has no *medullary sheath*. In many endogenous plants, as in the greater number of grasses, the centre of the stem is hollow. This is not the case at first, when the stem begins to grow; and when any cause makes the growth of the stem unusually slow, so that it is much stunted, it remains solid; the fistular character of the stem is the result of its rapid growth, rupturing the cells of the central portion, which finally disappear. Endogenous stems have no *cambium* and no proper *bark*. There is, indeed, a cellular *epidermis;* and there is also within it, and exterior to the hardest woody part of the stem, a comparatively soft layer of a corky substance, which is sometimes called bark, sometimes *false bark*, which does not separate from the wood below it without leaving myriads of little broken threads, the ends of the fibres which have extended into it from the hardest part of the stem. In those exogenous plants which produce lateral buds and branches, the fibres of the branches on descending to the stem extend on the outside of the proper stem, between its hardest portion and the false bark; and in this way a great thickness is sometimes attained, as in the dragon-tree. In the Grasses, a *plexus* of fibres takes place at the nodes, the fibres crossing from one side to the other. No British tree—and it may almost be said, no tree of temperate or colder climates—is endogenous. Almost all the endogenous trees are palms, although a few, as the dragon-tree, belong to other orders. Endogenous plants, however, are numerous in all parts of the world. Among endogenous plants are many of the plants most useful to mankind, particularly palms and grasses, all the true corn-plants being included among the latter. Nutritious substances are very extensively produced both in the fruit or seed, and in other parts; poisonous products are comparatively rare, although found in the *Araceæ*, *Liliaceæ*, *Melanthaceæ*, and other orders. Aromatic secretions are characteristic chiefly of one order, *Scitamineæ*. Besides palms and grasses, many of the endogenous plants are of great beauty, and many produce most beautiful flowers. Lilies and orchids may be mentioned as instances.



Transverse and Vertical Sections of Endogenous Stem.

Endogenous plants are *monocotyledonous;* and the terms *endogenous* and *monocotyledonous* are therefore often employed indiscriminately to designate the class. But Lindley distinguishes a class of *Dictyogens* (q. v.), which, although monocotyledonous, have stems approaching to the exogenous character. The leaves of endogenous plants generally exhibit parallel venation, which is indeed strictly confined to them, although a venation resembling it, or rather simulating it, may be seen in some exogenous plants. The seed also germinates in a peculiar manner, different from that of exogenous plants, and to which the name *endorhizal* has been given, the radicle being protruded from within the substance of the embryo, and surrounded by a cellular sheath formed from the integument which it breaks in its egress.

ENDO'RSE. See BILL.

ENDORSE, in Heraldry, an Ordinary containing the fourth part of a pale. *Endorsed*, again, or *indorsed*, signifies that objects are placed on the shield back to back.

ENDOSMO'SE AND **EXOSMO'SE** (Gr. inward motion and outward motion), terms applied by Dutrochet, the first investigator, to the transfusion that takes place when two liquids or two gases of different densities are separated by an animal or a vegetable membrane. As the transmission has no necessary relation to outwards or inwards, the term *osmose*, or *osmotic action*, is now preferred. See DIFFUSION.

This action performs a very important part in living organisms, and explains many phenomena of the circulation of sap and the processes of nutrition, which were previously referred only to the wonderful action of vital energy. Thus, the blood continually streaming through the capillary vessels gives forth a portion to the surrounding cells, and so supplies them with the necessary chyle. This may, however, by the expansion of the capillary vessels (see INFLAMMATION), lead to immoderate exudation. On the other hand, the blood, in passing by, takes up a number of worn-out constituents of the juices of these cells, and in this way serves, by the exchange which it effects, to restore the body, and to disburden it of products which have become useless.—In plants also, osmose performs an important part in the process of nutrition and the motion of the sap. The substances in the cells of plants are usually denser than the fluids without, and thus a process of endosmose takes place, by which the plant is supplied in the first instance from the soil, being incapable, however, of appropriating any nourishment which is not presented in a liquid state to the fibrils of its roots; whilst that which the roots give off by exosmose, is supposed gradually to unfit the soil for the growth of the same kind of plant. The bursting of the capsules of some kinds of plants is owing to a process of endosmose going on in the cells, as in the fruit of the Elaterium or Squirting Cucumber. Some of the *Entozoa*, as tape-worms, seem to live entirely by *endosmose*. See OSMOTIC ACTION.

ENDY'MION, in Greek Mythology, was a son either of Zeus or of Aëthlios, and followed, according to some accounts, the occupation of a herdsman or hunter, but according to others, was king of Elis. On account of his uprightness, he is said to have received, at his own request, from Zeus, the gift of immortality, unfading youth, and everlasting sleep; but another version is, that Zeus having taken him up to Olympus, E. fell in love with Here (Juno), and was condemned by her enraged husband to eternal sleep on Mount Latmos. Others, again, prettily fable that Selene (the Moon), charmed by the beauty of the youth, conveyed him to Caria, and sent him to sleep on Mount Latmos, that she might nightly kiss him unobserved. The Eleans, on the contrary, declared that he died among them, and in proof of it were wont to shew his monument. The myth of E. has been happily interpreted by Max Müller in his article on Comparative Mythology, in the *Oxford Essays* (1856). E., according to him, is one of the many names of the sun, but with special reference to the setting or dying sun, being formed from *enduo*, probably a dialectic variety of *duo*, the technical verb in Greek to express sunset. E. sleeps in the cave of Latmos, i. e., of night (from the same root as Leto or Latona, the night). So far the myth poetically describes certain phenomena of nature, the sinking of the sun in the west, and the rising of the moon, that seems to follow his departing beams. But the original signification of the metaphors becoming lost, as might naturally happen when the words expressing them had only a local usage, it was, we may say, inevitable that people should transfer the metaphors to persons, and invent a history to supply the place of the vanished poetry. And this invention, or, more properly, explanation (for it was doubtless made in all good faith), is what properly constitutes the myth of Endymion. The story has been made the subject of a poem by Keats.

ENE'MA (Gr. *en*, in, and *iēmi*, I enter), a medicine or fluid substance conveyed into the body by injection, usually through the rectum or lower bowel. See CLYSTER.

E'NEMIES, ADHERING TO THE QUEEN'S. By 25 Edw. III. st. 5, c. 2, it is declared that if a man 'be adherent to the king's enemies in his realm, giving them aid and comfort, in the realm or elsewhere,' he is to be held guilty of treason. Under this statute, the subjects of states at war with us are held to be enemies, though war has not been solemnly proclaimed. Every species of assistance, whether by joining in acts of hostility, or sending supplies or intelligence to the enemy, is deemed an act of adherence. To incite to hostilities the subjects of a state at amity with us, is not held to fall under this provision. But if the subjects of a friendly state make a hostile invasion, any British subject rendering assistance will be deemed guilty of treason under this clause. See TREASON.

ENEMY. An enemy, according to the civil law, is one who has publicly declared war against us, or we against him; all others are thieves or robbers. *Hostes hi sunt qui nobis, aut quibus nos, publice bellum decrevimus; cœteri latrones aut prædones sunt.* —*Digest*, i. 16, 118. Thus, in order to constitute an enemy, there must be a public declaration of war. This declaration must also be made by a duly organised state or kingdom, for a declaration of war by any turbulent body of men is not sufficient; and a hostile act committed by private citizens will not justify a war, unless that act be sanctioned by the government. The purpose for which this public declaration is required, is stated by Grotius to be that it may be clearly known that the war is undertaken not as a venture, but by the will of the two people. Hostilities having been formally declared, every subject of the hostile nations becomes an enemy of the opposing state, as do likewise those independent nations which attach themselves to the interests of either party. According to ancient usage, the utmost violence and cruelty was lawful towards those who were enemies of the state; but by the humane principles which prevail in modern times, warfare is to be carried on subject to certain general rules, which are intended as much as may be to abridge the calamities of war, and to protect the rights of individuals. Thus, an army invading an enemy's country is bound to suffer, as far as possible, the peaceable inhabitants to remain unmolested. Unnecessary devastation of the country and the seizure of property are also contrary to the laws of civilised war; and Grotius lays it down that the use of poisoned weapons, and of assassination, and violence to women, are to be reprobated. On the other hand, individuals taking up arms, without the sanction of the state, in order to annoy an invading enemy, are regarded as lawless marauders. The result of this distinction is, that such persons are not treated as prisoners of war, but are subject to be summarily dealt with by the commander of the invading army. As to the right of individuals to fit out vessels for the annoyance of the enemy, see PRIVATEERING and PIRACY. It appears to be a recognised principle of international law, that the property of an alien enemy residing in either of the hostile states may be confiscated. The Americans, during the war with England, asserted this right in regard to British property found in their territory. But the usage of civilised nations for a long period has much modified the stern rule of law. It is provided by Magna Charta, cap. 30, that if merchants 'be of a land making war with us, and be found in our realm at the beginning of the wars, they shall be attached without any harm of body or goods, until it be known to us, or our chief justice, how our merchants be intreated there in the land making war against us; and if our merchants be well intreated there, theirs shall be likewise with us.' And by 27 Edw. III. c. 17, merchants of a foreign state at war with us were allowed forty days, after proclamation of hostilities, wherein to remove from the kingdom themselves and their goods; and if that space of time were not sufficient, forty days more were to be conceded to them. Vattel (iii. 4, 63) denies that the right to confiscate the goods of an alien enemy is a right inherent in a state by the law of nations, insisting that a sovereign having permitted foreigners to enter the state, and to continue there, had tacitly promised them full liberty and security for their return. Whatever be the principle, there is no doubt that the almost universal practice of modern nations has been to respect the property of individuals at the outbreak of hostilities. Provisions are frequently inserted into commercial treaties, stipulating that, in case of war, the subjects of the enemy shall have time to depart, and even that they should be allowed to remain and carry on a peaceable trade. As to the practice in regard to EMBARGO and LETTERS OF MARQUE, see those articles. The right to confiscate the debts of the subjects of a hostile nation appears to rest on the same basis as that of the confiscation of other property. Trade between the subjects of two hostile powers is absolutely suspended during hostilities, unless permitted by express sanction; and the importation of articles particularly useful in war is contraband. All such articles, whether supplied by subjects of the enemy, or of another state, are seized and confiscated. See CONTRABAND OF WAR; see also PRIZE and PRISONER OF WAR. On the subject of this article, see Grotius, *De Jure Belli et Pacis*, lib. iii. cc. 3 to 7; Vattel's *Law of Nations*, b. iii. c. 4 and 5; Kent's *Commentaries*, vol. i. c. 3.

ENE'RGICO, an Italian term in music, meaning with energy and force; with strong articulation and accentuation, and a marked powerful delivery of the single notes, without losing in distinctness of execution.

ENFANTIN, BARTHÉLEMY PROSPER, the chief representative of St Simonism, and as such, usually styled Père Enfantin, was the son of a banker at Paris, where he was born in the year 1796. He became a pupil in the *Ecole Polytechnique* in 1812, but was expelled in 1814, in consequence of his having joined the pupils who left school and fought against the allies on the heights of Montmartre and St Chaumont. He was afterwards a commercial traveller in Russia, then a banker's clerk, and in 1825 became director of the *Caisse Hypothécaire*. About this time, he became a disciple of St Simon, whose ideas he developed, after the death of their author, in the *Producteur*. After the July revolution, E. associated himself with M. Bazard for the active propagation of St Simonism. Bazard preached it in its relations to philosophy and politics; E., mainly in its relations to the social state. Soon, however, a schism broke out between the two on the question of marriage and the relation of the sexes. Recognising the 'mobility' of the affections, E. affirmed that they ought to be 'free,' and of course pronounced against the ties of marriage. E.'s views were pushed so far, that government deemed it necessary to interfere on the grounds of public decency. The 'Supreme Father' (as his disciples were wont rather profanely to call him) was, after a trial of two days, sentenced to two years' imprisonment, and to pay a fine of 100 francs. Being released at the expiration of a few months, E. went to Egypt, and, after an absence of two years, returned to France, and became a post-master and farmer in the vicinity of Lyon. In 1841, he came to Paris, and was appointed a member of the Scientific Commission for Algiers, and on his return from Africa, wrote a sensible, interesting book, entitled *Colonisation de l'Algérie* (Paris, 1843). After the revolution of 1848, he edited the journal entitled *Le Crédit Public*, a paper retaining much of the old St Simonian character, but which had to stop in 1850 for want of funds. Since then, E. has held an important situation on the Lyon and Mediterranean Railway. His principal works are his *Doctrine de St Simon*, in conjunction with others (Paris, 1830); his *Traité d'Economie Politique* (Paris, 1831), and *La Religion Saint-Simonienne* (Paris, 1831). His most recent production with which we are acquainted, is a polemical pamphlet entitled *Réponse au Père Félix* (1858), a preacher who had attacked him.

ENFEO'FFMENT. See FEOFFMENT.

E'NFIELD RIFLE FACTORY. See SMALL ARMS FACTORIES, ROYAL.

ENFILA'DE is a military term applied to a fire of musketry or artillery made in the direction of the length of a line of troops or of a line of rampart. A besieging battery so placed as to send its shot along any part of the line of a fortification, and inside the parapet, does great execution in dismounting the guns, which thus present the largest surface to the balls. Hence the lines of rampart should be planned that their prolongations may fall in situations inaccessible to the enemy. Where this is not possible, the lines are either broken, or are protected by Bonnets (q. v.), or by Traverses (q. v.), or Blindages (q. v.). In the siege of a fortress, the trenches of approach are cut in a zigzag, to prevent the defenders enfilading them from the walls.

ENFRA'NCHISE, ENFRANCHISEMENT, to make free; the admission to certain liberties or privileges. Thus, a person made a denizen of the country, or receiving the freedom of a city or burgh, is said to be enfranchised.

ENFRANCHISEMENT OF COPYHOLDS. See COPYHOLDS.

ENGADI'NE, a famous valley in Switzerland, in the canton of Grisons, second only to the Valais in length, extends north-east for about 50 miles along the banks of the Inn, from the foot of Mount Maloja to the village of Martinsbruck. It is divided into two portions—that toward the south-west, called the Upper Engadine, and that toward the north-east, the Lower Engadine. The latter is wild and bleak; pent up within narrow limits among the hills, and having a huge barrier of glaciers between it and Italy, its climate is dismal. Frost and snow occur in July, and winter prevails for nine months of the year. The Upper Engadine is more open, and possesses much fine meadow-land. The Inn, which enters the valley at its south-west or upper extremity, and flows through it, has many towns upon its banks, the highest of which, Silvaplana, is about 5600 feet above sea-level, while the lowest, Martinsbruck, is 3137 feet. The inhabitants devote themselves principally to the rearing of cattle; they also make cheese, and export it largely. More than one-half of the young men emigrate at an early age, and betake themselves to continental capitals, where they often attain comparative wealth, in which case they almost invariably return, build a house in their native valley, and therein spend the remainder of their days. Pop. about 11,000, almost all of the Reformed or Calvinistic Church. The language most generally spoken is the Ladin (a corruption of Latin), a Romanic tongue, but differing from the other Romanic dialects of the Rhaetian Alps, and bearing a resemblance to the Italian.

ENGA'GEMENT, MILITARY, considered as a conflict between two armies or hostile forces, cannot be described within limits suitable for this work. Almost every term applicable to armies in the field bears relation, in some way or other, to a hostile engagement, and those terms will be found briefly noticed under their proper headings.

ENGAGEMENT, Naval, admits of more precise and terse illustration than a military engagement, because each ship of war is a unit in itself, bounded by a clearly marked watery margin from all the other ships of a fleet.

In the small war-vessels of ancient times, before the invention of gunpowder, a naval engagement usually began by running the galleys violently against each other, to crush or sink the enemy by means of the beak or prow. The prows were, for this purpose, armed with brazen or iron points. On the deck was sometimes a kind of turret filled with soldiers, the probable precursor of the *forecastle* in modern ships; and there was also frequently a platform for accommodating swordsmen, slingers, and javelinmen. High and bulky ships, of no great length, were best for this kind of warfare. Sometimes a massive piece of iron or lead, called a *dolphin*, was let down violently from the yard-arm, to crush or break through some part of the enemy's vessel. The men fastened sickles to the end of long poles, to cut the enemy's rigging and sails. Other means for carrying on a hostile attack were *battering-rams*—heavy maces with very long handles, stone-throwing machines, and grappling-irons.

In modern ships, preparations for an engagement are made with the utmost coolness and precision. The boatswain and his mates communicate to all the crew the order to 'clear for action.' The men take their hammocks, lower them, tie them up, and carry them to the quarter-deck, poop, forecastle, and other parts of the ship, where they are stowed between a double netting above the gunwale, and form a partial defence against the enemy's musketry. The sails, yards, booms, bowsprit, &c., are secured by strong chains and extra ropes, to prevent or lessen disaster if they are shot away. The boatswain and the carpenter collect together, and place at hand all kinds of pieces of wood, iron, rope, and canvas that may be useful in quickly repairing shot-holes and other damage. The gunner and his mates examine the cannon and the filled cartridges, and see that all the implements for gunnery are at hand. The master and his subordinate officers look to the trim and state of the sails. The lieutenants visit all the decks, to see that obstructions of every kind are removed. When the engagement is about to begin, the drums beat to arms. Every man repairs to his place. The marines are drawn up in rank and file on the quarter-deck, poop, and forecastle. The surgeon and his assistants are ready in the cockpit to amputate limbs, extract bullets, and dress wounds. Then begins the battle, which varies in its character according to the number and kind of ships on each side, the nature of the sea, the direction of the wind, and a multitude of other circumstances. In the British navy, the order of battle for a fleet is ordinarily in two lines, each being divided into the Starboard and Port Division or squadron. When the battle is ended, if it has been a severe one, the probabilities are that many men have been killed or wounded, decks and sides battered and splintered, cannon dismounted, rigging, masts, yards, and sails destroyed or torn. The whole ship's crew, except those disabled, then work hard to get the vessel back into trim; an attempt that frequently cannot be realised without aid from other ships, or from the resources of a port.

E'NGELHARDT, Joh. Georg Veit, a learned German theologian, was born 12th November 1791, at Neustadt on the Aisch, and studied at Erlangen, where, in 1820, he was appointed extraordinary professor, and in 1822 ordinary professor of theology. He died 13th September 1853. Patristic and medieval dogmatics, and Neoplatonism, are the subjects which he has chiefly investigated. In 1820, he published at Erlangen a translation of the first *Ennead* of Plotinus; in 1823 appeared his translation of the writings ascribed to Dionysius the Areopagite. His *Kirchengeschichtlichen Abhandlungen* (Erl. 1832), *Auslegung des speculativen Theils des Evangeliums Johannis durch einen deutschen mystichen Theologen* (Erl. 1839), and his contribution to the history of the mystical theology, entitled *Richard von St Victor und Johannes Ruysbroek* (Erl. 1838), are works of great value, and have thrown a new light on many important points. Very useful, too, especially on account of the richness of their special notices, are his *Handbuch der Kirchengeschichte* (Erl. 1834), and *Dogmengeschichte* (Neustadt, 1839). E., in the course of his life, wrote many learned dissertations in the *Journal of Historical Theology*, among which may be specified his *Ueber die Hesychiasten*, and *Ueber Erasmus Sarcerius*.

ENGHIEN, Louis Antoine Henri de Bourbon, Duc d', only son of Prince Henri Louis Joseph, Duc de Bourbon, was born at Chantilly, 2d August 1772. In 1789, he quitted France, and travelled through several countries of Europe. In 1792, he entered the corps of *émigrés* assembled by his grandfather, the Prince of Condé, on the Rhine, and commanded the vanguard from 1796 until 1799. At the peace of Lunéville, in the year 1801, he went to reside at Ettenheim, an old château on the German side of the Rhine, not far from Strasburg, and within the territories of the Duke of Baden. Here he married the Princess Charlotte of Rohan Rochefort, and lived as a private citizen. When the conspiracy of the Bourbon princes, headed by Cadoudal, Pichegru, &c., against the life and authority of Bonaparte, was discovered at Paris, the latter chose to believe that the Duc d'E. was privy to it, although there was not a tittle of evidence to prove this. Perhaps Bonaparte was afraid that the valour and humanity of the last descendant of the great Condé might one day prove dangerous to his power. Be that as it may, he unscrupulously resolved to seize the person of the duke. On the night of the 17th March 1804, the neutral territory of Baden was violated, and the château of Ettenheim surrounded with a body of soldiers and gendarmes. The duke, at first, endeavoured to defend himself; but the force was too great to be opposed, and he, with several friends and domestics, was captured, and carried prisoner to Strasburg, and immediately after to Vincennes. On the 20th of March, he was tried before a court-martial, consisting of eight officers, and after an examination of five hours, was condemned to death. Half an hour later, the sentence was put into execution. So cruel and audaciously criminal an act has fixed a deep stigma on the character of Bonaparte. M. Dupin has published the records of the trial, and shewn the illegality of the proceedings of the military commission. This illegality was publicly acknowledged by General Hullin, the president of the court. After the Restoration, the bones of the judicially murdered duke were taken up, and interred in the chapel of the castle at Vincennes.

ENGINEE'R and ENGINEERING. Engineering, the business of the engineer, is the art of designing and superintending the execution of works of a constructive character, such as roads, railways, bridges, canals, harbours, docks, works for supplying water to towns, drainage and sewerage works, mining machinery, and the working of metals.

It may be divided into two kinds—civil and military. The military engineer is an officer in the service of government, whose duties are principally to construct fortifications, to make surveys for warlike purposes, to facilitate the passage of an army by the construction of roads and bridges; in short, to execute all engineering works of a military nature; but he is also, especially in this country, called upon to undertake many works which more properly belong to the business of the civil engineer, such as the survey of the country—called the Ordnance Survey—the inspection of public works, and, in short, all the duties of a government engineer.

The civil engineering profession is subdivided into several sections, according to the special nature of the employment of its members. The railway engineer projects and superintends the execution of railways and all the works in connection with them, such as the alteration of roads and streams, the construction of viaducts, bridges, cuttings, and embankments. The hydraulic engineer constructs the works connected with the supply of water to towns, the filtering of water, its collection in reservoirs, and its distribution through a town or district; the irrigation and drainage of tracts of country; the protection of low lands from inundation, and the use of water as a motive-power. The dock and harbour engineer has the management of all works connected with the sea or navigable waters, such as the construction of piers, breakwaters, docks, harbours, and light-houses. The mechanical engineer is principally concerned in the manufacture of machinery, the working of metals, the construction of ships, steamers, cannon, and all the various structures in which the metals bear a prominent part. Then there is the mining engineer, who discovers minerals and manages mines; there are engineers who are specially engaged in the drainage of towns, and many other less prominent divisions of the profession.

In all engineering works, the *contractor* takes a very important part; he executes the works from the designs, and under the direction and superintendence of the engineer, and on his ability and good management the success of undertakings very materially depends.

The engineering works of antiquity are both numerous and prominent, many of them remaining while all other traces of their constructers have been swept away. The most notable of the works belonging to very remote antiquity are the harbours of the Phœnicians, the palaces and sewerage of Nimroud, and the pyramids of Egypt; next in order come the harbours of ancient Greece, the bridge of boats across the Dardanelles, made by Xerxes, to transport his immense army into Europe, and his canal across the isthmus of the peninsula of Mount Athos. The buildings of ancient Rome next claim attention—its theatres, temples, baths, and aqueducts, some of which carried water from distances of more than fifty miles into Rome; its roads, bridges, and drainage-works vie in extent and magnificence with the most celebrated works of modern times.

From that period down to the commencement of the 18th c., the most extensive works executed are the canals, embankments, and other hydraulic constructions used by the Dutch for the purposes of inland navigation, and to protect their low lands from the sea; the canals of North Italy, the cathedrals and fortifications of medieval Europe.

Civil engineering, as a distinct *profession*, may be said to have originated, in England, about the middle of the last century; since that time, the improvements in the steam-engine by James Watt, its subsequent application to the railway system by George Stephenson, and its use in navigation, have given a great impulse to commerce and civilisation; which, in their turn, have created the necessity for the numerous and magnificent engineering works of modern times; such as the innumerable railways, roads, and canals that intersect this and foreign countries; the bridges, water-works, docks, harbours, and vessels that facilitate our commerce and increase our comfort and prosperity. Among the most remarkable of these works may be mentioned the tubular bridges of the St Lawrence and Menai Strait, the Niagara railway suspension bridge, and the electric telegraph system, which covers this country and the seas and countries of Europe, and may, at some future time, connect us with the continents of America, Australia, and India. Among the more celebrated British engineers are the Stephensons, the Rennies, the Brunels, Telford, Smeaton, and Locke.

The education of those who would rise to eminence in the profession, must embrace a fair knowledge of pure mathematics and of the mixed sciences of natural philosophy, such as mechanics, hydrostatics, hydraulics, and optics. They should acquire a knowledge of the principles of projections, and should aim at being good draughtsmen and rapid and accurate arithmeticians.

Engineering is represented in this country by several institutions and societies, the principal of which is the London Institution of Civil Engineers, established in 1818, 'for facilitating the acquirement of professional knowledge, and for promoting mechanical philosophy;' there are also many schools and colleges throughout the kingdom in which engineering is made a special study.

In conclusion, it may be said that every day opens fresh fields to engineering science and labour; and that as the first beginnings of the art are lost in the obscurity of remote antiquity, so we see no termination to its usefulness and necessity.

The more important operations involved in engineering are treated of under such heads as BRIDGES, CANALS, AQUEDUCTS, EMBANKMENTS, TUBULAR BRIDGES, ROADS, RAILWAYS, RIVERS, SUSPENSION BRIDGES, &c.

ENGINEERS, THE ROYAL CORPS OF, forms one component portion of the army of the British empire. A similar corps exists in all regular armies. It is the scientific and constructive branch, intrusted with the making and defending of all military *works*, and the attack and conquest of similar works belonging to an enemy. It is true that civilians are often employed to construct the buildings themselves, at a stated price; but the military engineers make the plans, and are responsible to the country for their efficiency. At the present time, for instance (1861), contractors are at work on fortifications at Portsmouth and elsewhere, but on plans and under orders for which the engineer department of the government is responsible.

The Royal Engineers of the United Kingdom form one regiment or corps. The officers, in time of peace, are scattered all over the world. Their service is continuous, unlike that of other branches of the army. There is no half-pay, except on *permanent* retirement; and no unemployed list. They have much wear and tear of body and mind, and are considered entitled to a competent retiring allowance at an earlier age than other officers. Their regular pay corresponds to the active pay of other officers of the same rank; but they exclusively receive in addition *extra* pay, amounting to one half their ordinary pay when on duty at home, and equalling their ordinary pay when employed abroad. There is an establishment of Engineers in each colony, to conduct and superintend all the military buildings and works. The entire force is under a particular department of the War-office, that of the Inspector-general of Fortifications. Until the year 1763, the duties of military engineers were discharged by officers taken from the regular army. In that year, however, the corps of Engineers was formed, greatly to the advantage of the military service. In 1783, it was made a *royal* corps, and a distinctive uniform adopted. Several companies of artificers were, in 1812, converted into Sappers and Miners, and placed under the Engineers.

The non-commissioned officers and privates of this valuable corps are all workmen who have learned some mechanical trade; hence their skill in all constructive operations. The Ordnance Survey has been intrusted to the corps. For many purposes, the men are *lent*, to attend to special and peculiar work; and at such times their emolument is always increased. They often buy their discharge, in order to go into civil employments, when the prospects are good. The period of regular service is 21 years; but they can purchase their discharge at any time. They have to pay more for their discharge than other corps in the army. The average length of service is found to be something under five years, so many are the inducements to the men to purchase their discharge.

Officers intended for the Engineers enter the Royal Military Academy as cadets, and compete from time to time for commissions. When in the corps, promotion is by seniority, the purchase system not having been introduced.

The Army Estimates for 1861—1862 provided for the following number of officers and men in the corps of Royal Engineers:

Officers, ...	384
Non-commissioned officers, . .	370
Rank and file, ...	3781
	4535
Horses, ...	120

The sum set down for their cost for the year was £261,881, which, however, does not include any commissariat charges. The head-quarters are at Chatham, where there are Engineer barracks. The corps is grouped into battalions and companies.

ENGINEERS, in the Royal Navy, are the persons who attend to the machinery on board the war-steamers. When such steamers were at first adopted, men were obtained from private engineering establishments, or from merchant-steamers. In 1847 and 1848, many changes were made, to induce skilful and steady men to enter the service, and to maintain better discipline. The higher grades of them were raised from the rank of *warrant* officers to that of *commissioned* officers of a civil branch. There are now the grades of inspector of machinery, chief-engineer, and assistant-engineer, the last rank being subdivided into three classes. All these are commissioned officers, and are strictly examined before admission; their rank and promotion being by selection, and dependent on skill, character, and length of service. A chief-engineer is expected to be able to make notes in the log of every particular concerning the engines and boilers; to draw rough sketches of the machinery, with figured dimensions fit to work from; to understand and manage everything relating to engines, boilers, and furnaces; to understand practical mechanism generally, and the principles of theoretical mechanism. The assistant-engineer is expected to possess, in a smaller degree, the same kinds of knowledge and skill as the chief-engineer; and to act under his orders. The pay varies from £401 for an inspector of machinery, down to £64 for a third-class assistant-engineer on harbour service; the harbour-pay varies from £143 to £55. The Navy Estimates for 1861—1862 provided for 1089 naval engineers, besides 8 inspectors of machinery.

E'NGLAND, the southern and larger section of the island of Great Britain, and the most important member of the United Kingdom of Great Britain and Ireland. The geography of E. will be found under the head of Great Britain, the present article being confined to a sketch of its history previous to the union with Scotland.

Of the inhabitants of E. before the Christian era, little is known. In some of the ancient geographers, there are a few scattered notices of a rude population, with whom a limited commerce in tin was carried on by the Phœnician merchants; and our information scarcely extends further. What is known of E. under the Roman occupation has already been embodied in the article Britannia. An account of the country during the period intervening between the withdrawal of the Romans and the Norman Conquest will be found in the article Anglo-Saxons.

When William of Normandy landed in E. to claim the crown which Edward the Confessor had bequeathed to him, he found that the people had raised to the throne Harold, the son of a popular nobleman. The resources of the Saxons, however, had been wasted in domestic conflicts before the attack of William; and the battle of Hastings (1066 A.D.) gave E. with comparative ease to the Normans. The next twenty years saw the conquest completed, and nearly all the large landed estates of the Saxons pass, on every pretext except the true one, into the hands of the Normans. William claimed, indeed, to rule as sovereign by hereditary right, but this made little difference to the fact of conquest. All the high offices in the state and in the church passed into the hands of a new race. The Danes alone could retain either property or dignity. For long, some of the Saxons maintained an unequal resistance, retiring to the forests as the outlaws whose adventures furnished the materials for those favourite popular legends, where, as in Robin Hood, the spoiling of the richer classes is depicted as one of the chief virtues. In the course of time, the Normans were absorbed among the Saxons, their very language disappearing, though leaving many traces. From this union arose the English people and the English language as they now exist.

The union of the Normans with the Saxons was not fully effected so long as the Normans retained their foreign possessions. In King John's reign, the whole of these were lost, excepting Guienne and Poitou. Long wars under Henry III. and Edward III., and his famous son, the Black Prince, were continued, in the endeavour to regain the lost possessions; yet great victories like those of Cressy (1346 A.D.) and Poictiers (1356 A.D.) seemed to leave no result, for no sooner were the English armies withdrawn, than the populations returned to their French allegiance. After Agincourt (1415 A.D.), Henry V., when he had forced himself to be acknowledged heir to the French throne, was virtually king of France, and held his court in Paris; yet, in a few years more, the rebellion of Joan of Arc came at a time when E. was weakened with the Wars of the Roses, and (1451 A.D.) nothing of foreign ground was left to this country excepting Calais.

To their efforts to conquer France, the Norman kings added others. Henry II. conquered Ireland (1171 A.D.), Edward I. conquered Wales (1285 A.D.), and had almost added Scotland to his dominions. The bravery of Wallace and Bruce defeated the armies of Edward II., his successor; and though the idea of the conquest of Scotland was always a favourite one, an opportunity for attempting it on a great scale never again presented itself.

The great struggles of the successors of William were with the ecclesiastics and with the barons. Sometimes in these the popular sympathies were with, and sometimes against the crown. The conqueror himself and his immediate successors had no difficulty in maintaining the superiority of the courts of justice over the ecclesiastics; but even a sovereign so bold and skilful as Henry II. was forced, after the outcry occasioned by the murder of Thomas-à-Becket (1170 A.D.), to yield the point. The right to nominate the higher ecclesiastics was also secured by the popes. The degradation of the English monarchy was at its lowest when King John consented (1213 A.D.) to hold the crown as a gift from Rome. The weaknesses of this monarch had good as well as evil results, for from him the barons won their Great Charter (1215 A.D.). From Henry II. something similar had already been gained; but it was the Magna Charta of John which firmly established two great English principles—that no man should suffer arbitrary imprisonment, and that no tax should be imposed without the consent of the council of the nation. Under Edward I., the famous statute that no manner of tax should be imposed without the common consent of the bishops, barons, and burgesses of the realm, was passed (1296 A.D.); and before the time of Henry VII., the foundations of parliamentary government had been laid.

The union of the houses of York and Lancaster under Henry VII. begins a new period in English history. Part of his reign was disturbed by Perkin Warbeck and other pretenders to the throne, in support of whose claims the turbulent nobles found vent for their restlessness. But the greater part of his long reign was distinguished from preceding reigns as a time of peace and economy. During it, men's minds ripened for the great events of the next reign. Henry VIII. succeeded, under the most favourable auspices. He found the alliance of his now important country courted by both of his great contemporaries, Francis I. and Charles V. But the interest of the foreign complications of the reign merges in the struggle between the courts of E. and of Rome. The origin of the contest was the divorce which Henry desired to have from Catharine of Aragon, his brother's widow, to whom he had been married by papal licence. Cranmer and the English Church pronounced the marriage to be null, but a formal decree of divorce by the head of the church was then thought necessary in Catholic Europe. Pope Clement and the consistory, influenced by Spanish counsels, delayed, by every possible means, the decision of the question. E., however, was ready enough to support Henry. Wickliffe and his adherents had done not a little to shake the attachment of the nation to a foreign spiritual authority, by preaching doctrines which dispensed with the necessity for it. A parliament met, when the Commons took the significant step of presenting a long memorial of complaints against the church. The pope, still shewing no signs of yielding, bills followed, declaring the king the head of the church; rendering the inferior clergy amenable to the civil courts; abolishing the payment of the first year's fruits of ecclesiastical livings to Rome; and perhaps a more important thing than any of these, declaring that no convocation should meet unless the king should summon it, and that no ecclesiastical canons should have force except with the king's consent. To these measures, the pope replied by refusing the divorce, and excommunicating the king (1533 A. D.). The breach thus became irreparable.

A new act was passed giving to the magistrates the power of judging in questions of heresy. The next step was the suppression of nearly 400 of the smaller monasteries. The subsidence of an insignificant popular reaction, incited by the lower clergy, was followed by the suppression of the great abbeys. All these changes, however, touched only matters of church government. On matters of faith, Henry and his parliaments were as orthodox as the most conservative could wish. They embodied the leading doctrines of Romanism, disputed by the Protestants, in an act of parliament, known among the people as 'the bloody six articles,' and enforced conformity under severe penalties.

Henry was succeeded by Edward VI. His reign was marked by the general progress which the Reformation now made from questions of government to questions of doctrine. More thoroughly than ever the power of the clergy was sapped. The Book of Common Prayer (1548 A.D.) deprived them of the mysterious authority which the use of a foreign language in worship gave them in the eyes of the people, and the 42 Articles of the Church of England (1552 A.D.), the foundation of the present 39, denied, among other things, their power to work miracles in the elevation of the mass.

The next reign saw the inevitable reaction. The superstitions of the populace had been too rudely handled, and—as often happens before a crisis—there came a period of physical suffering. The conversion of cornfields into sheep-walks, induced by the high value of wool as an article of export, had thrown many out of employment; and the country was, moreover, infested with the crowd of vagrants whom the monasteries had been wont to maintain. The popular dissatisfaction coupled these things with the Reformation. Thus the opportunity was prepared for the atrocities of the reign of Mary. The queen herself was interested, by her mother's honour and her own, to uphold the Romanist faith; and her gloomy temper, aggravated by her unhappy childless marriage, believed that it did true service to God when it gave the rein to the bigotry of Pole and Bonner. In her first parliament (1553 A.D.), the whole legislation of Edward VI. was repealed, leaving the Church of England one in ceremonial and doctrine with the Church of Rome. Another parliament (1555 A.D.) repealed the legislation of Henry VIII., thus re-establishing the papal supremacy. Everything that the reformers had done was thus undone. Still the adherents of the Reformation were numerous, and when legislation failed to convert them, the fires of Smithfield were tried. Hooper, Bishop of Gloucester, was one of the first to suffer. Latimer, Ridley, Cranmer, followed, and the number who perished is not less than 300 by fire, and 100 by torture and the cruelties of confinement. Nothing more was wanted to turn the popular mind at once and for ever from the Church of Rome.

The accession of the Protestant princess Elizabeth came as a relief to the whole nation. The Romanists themselves were weary of the policy which made E. the tool of Spain, and were sickened with the cruelties which had been enacted. Elizabeth began by releasing from prison all confined on charges of heresy. Parliament followed (1559 A.D.) with acts restoring the royal supremacy over the church, and returning in general to the legislation of Edward VI. The Prayer-book and the Thirty-nine Articles were adjusted as they still exist. Fortunately for the country, the ministry of Elizabeth, guided by the able hand of Cecil, was one of peace. No opportunity was lost of aiding the Protestant cause throughout Europe; but Elizabeth had almost no open wars, and her long reign was disturbed by almost no domestic collisions. The mistake committed in detaining the queen of Scotland in an English prison, gave a constant incitement to disaffection among the adherents of the old faith, but no serious consequences ensued. Towards the close of the reign, Protestant and Catholic were alike patriotic in repelling the Armada (1588 A. D.). On the death of Elizabeth, the crowns of E. and Scotland were united.

The reign of James VI. does not present much that is remarkable. The plot, for which Sir Walter Raleigh suffered long afterwards, and the Gunpowder Plot—the insignificant proportions of which were so magnified for factious purposes—disturbed the earlier years; and the close of the reign found the nation engaged in an unfortunate war to assist the king's son-in-law, Frederick, Elector of Bohemia, against the Emperor Ferdinand II. of Germany. But for the greater portion of the 23 years of the reign, there was neither foreign nor domestic war. These years the king occupied industriously in rendering monarchy odious and contemptible. He lavished money upon unworthy favourites, and to supply his extravagance, openly sold the dignities of the peerage and the other honours of the state. His personal demeanour was vain, weak, and ridiculous; but in contrast with the insignificance of his talents was his extravagant conception of the extent of his royal prerogative. His conduct occasioned great discontent in parliament, and but for his timidity, might have led to more serious consequences.

The misfortunes of Charles I. were the legitimate result of the principles of his father. Charles committed the mistake of repeating, in the 17th c., acts which the Plantagenet sovereigns had done with impunity in the 14th and 15th. One of his first acts was to exact a benevolence to carry on the war. Had he been successful, this might have been overlooked, but when the bad management of the Duke of Buckingham lost the fleet off Rochelle, the indignation of the Commons was without bounds. In place of taking measures to allay this feeling, the king dissolved the parliament, and resolved to govern without calling another. In 1630, he concluded peace, and for the next seven years, in council with Strafford and Laud, he carried on the government. Taxes were raised as before without parliamentary authority; and when the taxes failed, money was raised by selling to the Roman Catholics immunities from the penal laws against their worship.

Nevertheless, there were limits to these methods of raising money; and in 1637, when the king found himself involved in a war with Scotland, in consequence of his endeavour to introduce a liturgy there, he was compelled to call a parliament. The Commons refused supplies, and were again dissolved. In 1640, the king once more summoned a parliament. He found the temper of the Houses more indomitable than ever. In place of voting him supplies, they impeached his minister Strafford, and condemned him to death. The Commons then presented a grand remonstrance to the king, embodying all the grievances the nation had suffered since the death of Elizabeth. Matters proceeded from bad to worse, till an open rupture came, and an appeal was made to arms. In August 1642, the king erected his standard at Nottingham, while the rebels took arms under the Earl of Essex. The first conflict was at Edgehill, where the loss on both sides was severe and nearly equal. The fortune of war continued to vary, till at Marston Moor it turned against Charles, and at Naseby, in June 1645, he was finally defeated. He was executed on 30th January 1649.

The government for the next four years was conducted by parliament. Meanwhile, Cromwell was rising into distinction, and power gradually fell from the hands of parliament into those of the military. In 1653, Cromwell had himself proclaimed 'Protector.' He was now absolute monarch. He governed with a firm hand, and never was E. more respected abroad than during his time. In 1654, he concluded peace with Holland, and employed the gallant Admiral Blake in an expedition against the Spaniards, which ended brilliantly for the English navy. But the nation grew as discontented with the government of Cromwell as it had been with that of Charles. After the death of the Protector in 1658, and a short interval during which his son Richard held the office, parliament received with acclamations a proposal from Charles II. to return. In May 1660, the populace clamoured with delight on the royal entry to London of him who, a few years before, had fled from Worcester for his life.

While Clarendon was minister, the government of Charles II. was well conducted. A war with Holland was brought to a successful ending in the conquest of New York. On Clarendon's resignation, the government passed into the hands of the ministry known as the Cabal. They were as profligate and as careless as the king himself. A succession of cruelties against the Catholics, for which the pretended revelations of Titus Oates and his imitators furnished the excuse, betokened rather the wanton temper of the sovereign and the nation, than any zeal for the Protestant religion. The only act which reflects much credit on any portion of the reign was the passing, in 1679, of the *Habeas Corpus* Act, designed more effectually to protect the liberty of the person. Strong efforts were made in parliament after that to pass the Exclusion Bill, the object of which was to exclude the Duke of York, as a Roman Catholic, from the succession. To the great satisfaction of the king, parliament rejected the bill. In 1681, parliament was dissolved, and Charles II. never called another.

After this there was a change for the worse in the character of the government; from being wantonly indifferent, it became sullenly mischievous. Presbyterians and Nonconformists were excluded from all offices. Among other arbitrary acts, may be mentioned the recall of their charters from London and many of the other principal cities, which were only restored, with diminished privileges, on payment of heavy fines. Conduct such as this made men more than ever afraid of the succession of the king's brother. A conspiracy to secure the succession to the Duke of Monmouth, an illegitimate son of the king, was formed. Lord Howard betrayed the conspiracy, and among others who suffered death for it were Lord Russell and Algernon Sidney.

When the king died, in 1685, James II. succeeded amid universal dissatisfaction. Monmouth's attempt to seize the throne, however, was mismanaged, and failed. The punishment of those who had aided his rising formed an occasion for the perpetration of great cruelties by Jeffreys, then chief justice of England. In the meantime, nothing could be fairer than the king's language. He issued a declaration in favour of general toleration, and announced that the penal laws against Catholics were no longer to be enforced. A second declaration to the same effect was issued, but he went further, and added to it an order that the clergy should read it in all churches. The Archbishop of Canterbury and six bishops presented an address to the throne, humbly setting forth that their duty to maintain the Protestant establishment would not permit them to give obedience to the royal mandate. For this they were indicted as guilty of sedition. The trial of the bishops (1688 A. D.) was the turning-point of James's career. It created immense excitement, and when the jury returned a verdict of not guilty, even the soldiers joined in the tumultuous rejoicings.

William, Prince of Orange, who had married Mary, the eldest daughter of the king, had long been intriguing with the malcontents. He now landed in E. with a small body of troops. The soldiers, the leading nobles, even the king's own children, joining the prince, the king fled to France. Parliament then settled the crown jointly on William and Mary for life. James, with the assistance of Louis XIV., made one effort to regain his throne. He landed in Ireland, where the lord lieutenant, Tyrconnel, was devoted to his cause, and managed to raise an army. William defeated him at the battle of the Boyne; and the contest was soon after this terminated by the second flight of James to France. So easily was the great revolution of 1688 effected.

The domestic government of William was marked by his efforts to introduce a general toleration; but of his foreign administration, which led the country into costly wars, it is hardly possible to speak in very favourable terms. To reduce the threatening power of France, E., in alliance with Holland and Germany, embarked in a protracted contest. Its termination at the peace of Ryswick, in 1697, brought to E. nothing beyond an increase of reputation. William died in 1702.

Under Queen Anne, the war with France was renewed, and the Duke of Marlborough's splendid victories of Oudenarde, Blenheim, and Ramilies were achieved. With these the history of E. as a separate state closes. In 1707, the long-wished-for union with Scotland was accomplished; and after that, Great Britain, united under one legislature, as well as under one crown, has a common interest among nations, and therefore a common history.

A table of the English sovereigns is appended, beginning with Alfred, and continued, for convenience' sake, to the present time:

	Began to Reign.	Years of Reign.
ANGLO-SAXON LINE.		
Alfred, king of Wessex,	871	30
Edward I., king of Wessex, Mercia, &c.,	901	24
Athelstan, king of England,	925	15
Edmund I.,	940	6
Edred,	946	9
Edwy,	955	4
Edgar,	959	16
Edward II.,	975	3
Ethelred,	978	38
Edmund II.,	1016	1
DANISH LINE.		
Canute,	1017	19
Harold I.,	1036	3
Hardicanute,	1039	2
SAXON LINE.		
Edward III.,	1041	25
Harold II.,	1066	
NORMAN LINE.		
William I.,	1066	21
William II.,	1087	13
Henry I.,	1100	35
HOUSE OF BLOIS.		
Stephen,	1135	19
PLANTAGENET LINE.		
Henry II.,	1154	35
Richard I.,	1189	10
John,	1199	17
Henry III.,	1216	56
Edward I.,	1272	35
Edward II.,	1307	20
Edward III.,	1327	50
Richard II.,	1377	22
HOUSE OF LANCASTER.		
Henry IV.,	1399	14
Henry V.,	1413	9
Henry VI.,	1422	39
HOUSE OF YORK.		
Edward IV.,	1461	22
Edward V.,	1483	
Richard III.,	1483	2
HOUSE OF TUDOR.		
Henry VII.,	1485	24
Henry VIII.,	1509	38
Edward VI.,	1547	6
Mary,	1553	5
Elizabeth,	1558	45
STUART LINE.		
James I.,	1603	22
Charles I.,	1625	24
Commonwealth,	1649	10
STUART LINE.		
Charles II.,	1660	25
James II.,	1685	3
HOUSE OF ORANGE.		
William and Mary,	1688	14
STUART LINE.		
Anne,	1702	12
BRUNSWICK LINE.		
George I.,	1714	13
George II.,	1727	33
George III.,	1760	60
George IV.,	1820	10
William IV.,	1830	7
Victoria,	1837	

ENGLAND, NEW. See NEW ENGLAND.

ENGLAND AND IRELAND, UNITED CHURCH OF. A brief sketch of the origin and early history, as well as an outline of the doctrines and form of government of this church, will be found under the head ANGLO-CATHOLIC CHURCH. See also the articles AUGUSTINE, DUNSTAN, and ODO. Up to the time of the Reformation, ecclesiastical affairs would be more properly described as the history of the Church *in* England; from that period the Church *of* England dates her existence. She, however, retains so much of antiquity, and her institutions, laws, and formularies are so interwoven with the history of the past, that it would be impossible to have any correct or connected view of them, and of her *connection with the state*, her characteristic feature, without at least glancing rapidly over the leading events between the Conquest and the reign of Henry VIII. During the three centuries from the Norman Conquest (1066) to the preaching of Wickliffe (1356), her history can be regarded only as a continual struggle between the ecclesiastical and civil power, and there would be little else to describe than the methods by which the mitre triumphed over the crown, and the crown invaded the rights and property of the church. In the time of William I., nearly half the country was in the hands of spiritual persons. He ejected the English clergy, and supplanted them with Normans; and although he was possessed of full power over the church, yet in his reign were sown the seeds of future papal encroachments. Papal legates were then first introduced into England, and the ecclesiastical courts separated from the civil. From this time, the increased influence of Rome may be traced to the defective titles, the usurpations, and the violent conduct of the kings. Thus, the defective title of Henry I. made him seek popularity by recalling the primate Anselm, who had incurred the displeasure of his brother William, and had fled the country. Anselm was devoted to the pope, who had espoused his quarrel, and refused to do homage to the king for the temporalities of his see, till at length Henry found himself obliged to surrender the right of *Investiture.* Thus, too, Stephen's usurpation opened the way for further encroachments; and Henry II., who found the power of Rome greatly augmented, helped to extend it further, by accepting a grant of Ireland from the pope. Then followed the opposition of Thomas-à-Becket, which arose out of the question of the punishment of ecclesiastics by the civil power. For the moment, it seemed that the quarrel was healed by the *Constitutions* agreed on at Clarendon (q. v.), but it broke out more violently than ever. The pope discharged Becket from his oath, and condemned the Constitutions. Becket had fled from the kingdom; and his subsequent return, murder, and canonisation, all tended to strengthen the authority of the church. It was not, however, till the reign of John, when England was laid under an interdict, and the king resigned his crown to the pope, that the papal encroachments rose to their height; and the weak reign of Henry III., which followed, did nothing to abate them. Edward I. gave a check to the power of the clergy, subjected them to taxation, and passed the statute of Mortmain (1279), which prohibited the transfer of land without the king's consent. There is little to be said as to innovations in doctrine during these three centuries; but it may be noted, that about the middle of this period, viz., 1213, the council of St John Lateran declared transubstantiation, or the bodily presence of Christ in the consecrated elements, to be a tenet of the church.

It was in 1356 that a new period commenced. Wickliffe then published his first work, entitled *The Last Age of the Church,* directed against the covetousness of the Church of Rome. His doctrines correspond in many points with those now taught by the Church of England, but he differed from her in regard to the necessity of Episcopacy, which he rejected; he also believed in purgatory, and permitted prayers for the dead. His chief objects of attack were the papal indulgences, and the doctrine of transubstantiation. It has been observed concerning the condemnation at Oxford of Wickliffe's opinions with respect to the latter, that 'this was the first plenary determination of the Church of England in the case, so that this doctrine, which brought so many to the stake, had but with us 140 years' prescription before the times of Martin Luther.' In a limited sense, he upheld the efficacy of the seven sacraments. Wickliffe had a large body of followers. They were called *Lollards,* probably from a German word, *lullen,* to sing with a low voice. The storm of persecution which he escaped by death, fell upon them. Henry IV. thought it necessary to fortify his usurped position by assisting the bishops against the Lollards; and from this time to the Reformation, there was an uninterrupted succession of confessors and martyrs. Sir John Oldcastle, Lord Cobham, was the most illustrious of these sufferers. Fox gives a detailed account of nearly twenty individuals burned for heresy between the death of Lord Cobham and 1509, when Henry VIII. ascended the throne. To some extent, the blood of these martyrs was the seed of the Reformed Church; but we must not overlook the 'hidden seed' which was growing secretly, from the time that Wickliffe gave to his countrymen a translation of the Scriptures in their own tongue. The progress of learning, and especially the study of Greek, led to a better understanding of the sacred books, whilst the invention of printing (1442) caused a wider circulation of them.

The above causes, however, would probably have proved insufficient to produce the great change which was now impending, had not Henry VIII.'s divorce from Catharine of Spain led to a quarrel between him and the pope, which ended in the total abolition of the papal authority within the kingdom. Then began the REFORMATION in earnest. For the details of that great event, consult the article under that head, and the lives of such men as Wolsey, Sir Thomas More, Fisher, Clement, Luther, Cromwell, Cranmer, Latimer, and Ridley, &c. From this period may be dated the existence of the Church of England as a separate body, and her final separation from Rome. For the opinions of the church in Henry's reign, two important books which were then published should be consulted—viz., the *Bishop's Book,* or the *Godly and Pious Institution of a Christian Man,* and the *King's Book,* which was a republication of the same in a more perfect form in 1543, and called *The Necessary Erudition for any Christian Man,* and was called the *King's* Book because put forth by royal authority. A book of *Articles devised by the Kinges Highnes Majestie to stablyshe Christen Unitie,* should also be consulted. It has been stated in the article ANGLO-CATHOLIC CHURCH, that the reformation in *doctrine* did not make much progress in Henry's reign; from these books, it will be seen that it was rather retrograde. The monks, too, who were dispossessed at the dissolution of the monasteries, were dispersed amongst local cures, and kept alive the old opinions, and the lower orders were not as yet favourable to the new doctrines. Cranmer was the leader and presiding genius of the Reformed opinions; and the youth of Edward VI. left the king pliant in the hands of the archbishop. The Book of Homilies, put forth in 1540, the New Communion Service and Catechism in 1548, the first Book of Common Prayer in 1549, and the Forty-two Articles in 1553, all bear the impress of his hand, and it was these which advanced and fixed the doctrines of the Reformation. Nor was the temporal authority idle on the same side—Bonner and Gardiner were committed to prison, and both were deprived of their bishoprics. In fact, the way in which all the institutions of the Church of England were established in Edward VI.'s reign by the help of the civil magistrate, have brought upon her the charge of Erastianism. The civil power had just delivered her from a foreign tyranny; and when the weak health of the young king, the known sentiments of his successor, Mary, the ignorance of the common people, and the interested views of the old clergy, are considered, it cannot be a matter of surprise, still less of blame, that the same arm was relied upon for the establishment of the new forms of religion.

Although Mary promised at her accession that she would put constraint on no person's religion, her promise was not kept. Bonner and Gardiner were restored; the Book of Common Prayer and Catechism were declared heretical; the kingdom was reconciled to the see of Rome; a persecution of the chief reformers commenced—Rogers was burned at Smithfield, Hooper at Gloucester, Saunders at Coventry, Taylor at Hadley. The prisons were filled with 'heretics;' many fled beyond sea; some purchased safety by an outward conformity. Cranmer, Latimer, and Ridley perished in the flames at Oxford. Cardinal Pole was made primate. One benefit was conferred on the church by Mary—she surrendered all the church lands, as well as the first fruits and tenths, which had been seized by Henry. At last the death of Mary, with which that of the cardinal was all but simultaneous, delivered the church from its oppressors. The passing of the *Act of Uniformity* in the first year of Elizabeth's reign, restored the Common Prayer-book to general use, and enjoined the same dresses as were in use at the time of the first Prayer-book of Edward VI.

All the bishops except one, Kitchin of Llandaff, refused to take the oath of uniformity, and were ejected from their sees to the number of 14 (the eleven remaining sees were vacant by deaths), and 175 other beneficed clergy were deprived for the same cause—no very considerable number, when it is remembered that there were then 9400 benefices in England. There was some difficulty in filling up the vacant bishoprics, and perhaps some slight informalities. Matthew Parker was made Archbishop of Canterbury. For the refutation of the fable of the NAG'S-HEAD CONSECRATION, see the article under that head. In 1562, the Thirty-nine Articles were finally reviewed and subscribed. These, with the Book of Common Prayer, are the tests of orthodoxy in the Church of England.

But what was done to satisfy the scruples of Protestant nonconformists? An attempt in this direction was made in the reign of James I. at the HAMPTON COURT CONFERENCE (q. v.). The result was another review of the Common Prayer-book; and this, with the new translation of the Bible, and the passing of the canons of 1604, were the principal ecclesiastical events of James's reign. These canons received the sanction of the crown, but not that of parliament; they are not, therefore, binding on the laity, but they are still binding on the clergy to some extent, and they regulate the practice of the ecclesiastical courts, and are the only rule, on some points, to which the bishops and clergy can appeal. See the articles LAUD and CHURCH OF SCOTLAND for the events of Charles I.'s reign. The great rebellion overthrew both church and state. The bishops were declared 'delinquents,' robbed of their property, and abolished; and the clergy were ejected from their benefices. Laud was put to death in 1645. The Church of England had no corporate existence during this interval. With the restoration of the monarchy, 1660, came the restoration of the church. The reaction from Puritanism to Prelacy was complete. Attempts were made, but with small success, to win over the Puritan leaders; bishoprics were offered to Baxter, Calamy, and Reynolds; but the last only accepted. The SAVOY CONFERENCE (q. v.) was an unsuccessful, perhaps insincere attempt to comprehend the nonconformists in the Established Church. But the demands of the Presbyterians were most immoderate. Baxter went so far as to propose the substitution of an entirely new book of his own composition, in the place of the Common Prayer-book. After the failure of the Savoy Conference, this was once more reviewed; and a new Act of Uniformity in 1662 made its use, as it now stands, compulsory in all the churches.

The Church of England passed through one more critical period before reaching that tranquillity in which, for upwards of a century, she slumbered too securely. In 1687, James II. published the famous Declaration of Indulgence, which filled up the measure of popular discontent, and finally cost him his crown. Although by this declaration, which was perfectly illegal, liberty of conscience was permitted to all his subjects, it was clearly understood that the liberty was intended only for the papists. The nonconformists refused to accept the treacherous boon. Eighteen bishops out of twenty-five refused to publish the declaration, as ordered, in their dioceses. Seven of them—Sancroft, Lloyd, Ken, Turner, Lake, White, and Trelawny—drew up a remonstrance to the king; they were summoned before the privy council, and sent to the Tower. The whole city was in commotion; and great was the rejoicing when, on being brought to trial in Westminster Hall, they were acquitted. On the 5th of November following, 1688, the Prince of Orange landed in England. It is worthy of remark, that out of these seven bishops three refused to swear allegiance to him, and were joined by a considerable number of the clergy; these were called Nonjurors. In the first year of William and Mary's reign, the Toleration Act was passed, and dissent ceased to be illegal. Another attempt was made to comprehend the nonconformists in the church, but the lower house of Convocation was in no tolerant mood, and the attempt failed, but chiefly in consequence of the disturbances in Scotland. In 1717, Convocation was dissolved. After slumbering for nearly 140 years, it has been once more called into life and action in the province of Canterbury. See the article CONVOCATIONS.

That the Church of England, after fighting for its very existence against popery on the one hand, and against Puritanism on the other, should have subsided into inactivity during the dull reigns of the Georges, is less a matter of surprise than of regret. The peaceful enjoyment of her temporalities in a dull, irreligious, not to say infidel age, may easily account for, though it cannot excuse, her idleness. But that in the rise of John Wesley, 1730, she should have failed to see a grand opportunity for herself, is a matter of both surprise and regret; she, however, let it pass; nor can she hope that such another will ever again present itself. The utmost that can be hoped is, that she has seen her error. The next important event in the history of the church is the Act of Union, which came into effect on the 1st of January 1801, and united the churches of England and Ireland in all matters of doctrine, worship, and discipline. The Reformation had made some progress in Ireland under Edward VI. Five Protestant bishops were appointed in 1550, and the English Bible and Liturgy were introduced in 1551; but from a variety of causes, the Reformed doctrines have never found much acceptance with the native population; and although a Protestant church was established by law, it was and is the church of the minority (see IRELAND). In 1635, the English Articles were received; and in 1662, the English Book of Common Prayer was adopted by convocation. Before the political union of the countries, the two churches were in full communion. By an act of the imperial parliament in 1833, ten of the Irish bishoprics were suppressed, and the funds thus obtained were applied to the augmentation of small livings and the building and repair of churches. There are now twelve Irish bishops.

In later times, two great controversies have shaken the English Church, but have led to nothing more than some internal divisions, and the secession of some members to Rome, and a few to the ranks of dissent. These were the Tractarian and the Gorham controversies. The former was occasioned by some Tracts which began to be published at Oxford in 1833, the object of which was to revive something of the spirit of Catholic antiquity, and reform the abuses and slovenly practices which had crept into every part of the church system. See TRACTS FOR THE TIMES. The Gorham Controversy (q. v.) related to the doctrine of baptismal regeneration. The Tractarians are accused of Romanising tendencies; and their views, when carried to extremes, undoubtedly lead in that direction, as is proved by the numerous secessions to that church. With the extreme Low Church party, Episcopacy is rather an expedient than a necessary form of church government. They think but little of the efficacy of sacraments, and deny that regeneration necessarily takes place in infant baptism. Justification by faith, the atonement of the cross, and the Calvinistic doctrines on election, are their leading topics in preaching. See the life of Simeon and of Venn for the views of this party.

What are called Broad Church views, are those which are attributed to men of the Arnold school, and the followers of Mr Maurice (q. v.). Those who hold them can scarcely be called a party, and are, indeed, unwilling to be so considered; but if their position must be defined, they might be described as a party between, and somewhat antagonistic to, both the High and Low Church parties. The High Church party insist on the authority of the church and priesthood, the efficacy of sacraments when rightly received, and the necessity of apostolical succession in the matter of orders, and in their general teaching they take the Prayer-book as the exponent of Scripture. They are scrupulous in observing the rubrics, and have done much to revive the practice of daily prayer in the churches, and the observance of the festivals. Order, unity, antiquity, and catholicity are what they profess to have in view.

There are at present, in round numbers, 11,730 benefices in England and Wales, of which 1260 are new districts, which are being continually formed out of the old large and overpopulous parishes. Various acts of legislation have of late years facilitated this. These districts are called perpetual curacies, or incumbencies, and for the most part are but very slenderly endowed. The old benefices are either rectories, where the incumbent receives the *great* or corn tithes, or vicarages, where he receives the small tithe only. The great tithes had anciently been bestowed upon the neighbouring monasteries, who undertook the cure of the souls, and appointed vicars for the purpose, who lived on the small tithes and the offerings of the people. At the dissolution of the monasteries, many of the great tithes were given to laymen, and laymen now extensively hold them, and some to endowed colleges. There are two popular errors with respect to church property: one is, that the endowments were in some way made by the *state;* the other, that they are very rich. Neither of these is the case. The endowments were all by private beneficence, and there is no tenure so ancient as that by which the parish church holds her property. In the aggregate, the amount is very large, and was ascertained by the commission appointed in 1830 to be as follows: Bishops, £181,631; deans and chapters, £360,095; parochial clergy, £3,251,159: total annual revenue, £3,792,885. The revenues of the Irish branch are stated at £1,000,000, but this is probably in excess of the truth. Since 1830, the English revenues must have rather increased from private beneficence and the increase in the value of property. Divided equally amongst the whole number of benefices, this would give an average of less than £300 per annum for the joint support of incumbent and curates. It appears, from the last census, that there are in England and Wales 14,077 churches or chapels, served by 17,320 ministers, or 123 ministers to every 100 buildings. The fixed character of the church endowments, and their generally substantial buildings, have secured for the poorest and the most sequestered, and sometimes the most populous neighbourhoods, from which wealth and civilisation have emigrated, at least a nucleus, and often a fruitful seed of moral and religious improvement; whilst the fixity of the church doctrines has been a standard of truth to restrain the license of individual opinion. The church rates, amounting to £500,000 annually, are no part of the ministers' endowment; they are collected from time immemorial, and exclusively devoted to the repairs of the church fabric, and the warming, lighting, cleaning, &c., of the church; and are under the exclusive control of the churchwardens; of these there are two in each parish, one generally nominated by the minister, the other elected by the parishioners.

The Church of England has three orders of clergy —bishops, priests, and deacons. Generally, a degree at one of the English universities, or of Dublin, is required in a candidate for orders; but in Wales and some of the more populous districts, this condition is dispensed with. There are 2 archbishops (Canterbury and York) and 26 bishops in England; besides 2 archbishops and 10 bishops in Ireland. The archdeacons and rural deans assist the bishops in the management of their dioceses.

The patronage of the church is in a great variety of hands—in the crown, the bishops, the nobles and gentry, and incorporate bodies such as colleges and cathedrals. Advowsons and next presentations may be sold as property, but a presentation may not be sold when a living is vacant. A clergyman is 'presented' to his living by the patron, he is inducted by the bishop or his appointee; he must 'read himself in,' i. e., he must read the Thirty-nine Articles after the morning or evening prayer within two months after induction.

The Episcopal Church in Scotland is not in union with that of England.

The above sketch has been largely drawn from Short's excellent *History of the Church of England;* see also Marsden's able *Dictionary of Christian Churches and Sects*, and Hardwick; also Fuller's *Church History*, Collier, Strype, Mosheim, Burnet, and Clarendon. Among the great divines whose works should be consulted for further information regarding the views of the church, may be named Barrow, Pearson, Hooker, Jeremy Taylor, Lightfoot, Hammond, Sancroft, South, Tillotson, Bishop Butler, Atterbury, Bull, Sherlock, and others.

ENGLANTÉ, in Heraldry, is bearing acorns or other similar glands.

E'NGLESHERY, E'NGLESBURY, i. e., being an Englishman. The presentment of Engleshery is thus explained, Hale's *Pl. of Crown*, p. 446: 'Anciently, there was a law introduced by Canutus the Dane, that if any man were slain in the fields, and the manslayer were unknown, and could not be taken, the township where he was slain should be amerced to sixty-six marks; and if it were not sufficient to pay it, the hundred should be charged, unless it could be made appear before the coroner, upon the view of the body, that the party slain was an *Englishman;* and this making it appear was various according to the custom of several places, but most ordinarily it was by the testimony of two males of the part of the father of him that was slain, and by two females of the part of his mother.' William the Conqueror continued this law. Presentment of Engleshery was taken away 21 Edw. III. st. 1, c. 4.

E'NGLISH, forms the first part of several geographical names.—1. English Cove is a bay of the Pacific Ocean, on the south-west coast of New Ireland, in lat. 4° 54′ S., and long. 152° 35′ E. —2. English Harbour, on the south side of Antigua, is one of the best havens in the West Indies. It is situated in lat. 17° 3′ N., and long. 61° 45′ W.—3. English Harbour is on the Pacific shore of Costa Rica, in Central America, lying in lat. 8° 50′ N., and long. 83° 55′ W.—4. English River is an estuary on the west side of Delagoa Bay, an inlet of the Indian Ocean, in Africa. It is about lat. 25° 58′ S., and long. 32° 36′ E.— 5. English River, otherwise known as Mississippi or Great Water, enters Hudson's Bay from the west, at Fort Churchill, about lat. 59° N. and long. 94° W., after an estimated course of 630 miles.

ENGLISH or BRITISH CHANNEL (*La Manche* or the *Sleeve* of the French, and the *Oceanus Britannicus* of the Romans) is the narrow sea which separates England and France, having on the north the English counties of Kent, Sussex, Hants, Dorset, Devon, and Cornwall; and on the south the French provinces of Artois, Picardy, Normandy, and Bretagne. On the east, it joins the North Sea, at the Strait of Dover, where it is narrowest, being only 21 miles wide from Dover to Cape Grisnez. From this strait it runs west-south-west for 280 miles, and joins the Atlantic Ocean at the Chops, with a breadth of 100 miles between the Scilly Isles and Ushant Isle. With an average breadth of 70 miles, it is 90 miles wide from Brighton to Havre; 60 miles from Portland Point to Cape La Hague; 140 miles—its greatest breadth—from Sidmouth to St Malo; and 100 to 110 miles west of the latter line. It occupies 23,900 square geographical miles, and includes the Scilly Isles, Channel Isles, Ushant Isle, Isle of Wight, and many islets and rocks, especially off the coast of Bretagne. It is shallowest at the Strait of Dover, where a chalk-ridge at the depth of twelve to thirty fathoms joins England and France. West of this, it deepens to sixty fathoms, with some banks at three to five fathoms, and some hollows five to thirty fathoms deeper than the parts around. A coarse gravel covers the bottom. The English coast-line of the E. C. is 390 miles long, with an inshore depth of twelve to fifty-five fathoms, and the French coast-line of the E. C. is 570 miles long. Westerly winds prevail in the E. C., and the current, though imperceptible, is always from west to east. The E. C. abounds in fish, of which the chief are pilchard, mackerel, and oysters.

ENGLISH CONSTITU'TION. See PARLIAMENT.

ENGLISH DRA'MA. See DRAMA.

ENGLISH LA'NGUAGE, which is now spoken by upwards of 50 millions of the earth's inhabitants, is in its vocabulary one of the most heterogeneous that ever existed; a fact, the causes of which are to be traced in the history of England (q. v.). Its composition and grammatical character are thus described by M. Müller in his *Lectures on the Science of Language* (1861): 'There is, perhaps, no language so full of words evidently derived from the most distant sources as English. Every country of the globe seems to have brought some of its verbal manufactures to the intellectual market of England. Latin, Greek, Hebrew, Celtic, Saxon, Danish, French, Spanish, Italian, German—nay, even Hindustani, Malay, and Chinese words—lie mixed together in the English dictionary. On the evidence of words alone, it would be impossible to classify English with any other of the established stocks and stems of human speech. Leaving out of consideration the smaller ingredients, we find, on comparing the Teutonic with the Latin, or Neo-Latin, or Norman elements in English, that the latter have a decided majority over the home-grown Saxon terms. This may seem incredible; and if we simply took a page of any English book, and counted therein the words of purely Saxon and Latin origin, the majority would be no doubt on the Saxon side. The articles, pronouns, prepositions, and auxiliary verbs, all of which are of Saxon growth, occur over and over again in one and the same page. Thus, Hickes maintained that nine-tenths of the English dictionary were Saxon, because there were only three words of Latin origin in the Lord's Prayer. Sharon Turner, who extended his observations over a larger field, came to the conclusion that the relation of Norman to Saxon was as four to six. Another writer, who estimates the whole number of English words at 38,000, assigns 23,000 to a Saxon, and 15,000 to a classical source. On taking, however, a more accurate inventory, and counting every word in the dictionaries of Robertson and Webster, M. Thommerel has established the fact, that the number of Teutonic or Saxon words in English amounts to only 13,330 against 29,354 words which can either mediately or immediately be traced to a Latin source. On the evidence of its dictionary, therefore, and treating English as a mixed language, it would have to be classified together with French, Italian, and Spanish, as one of the Romance or Neo-Latin dialects. Languages, however, though mixed in their dictionary, can never be mixed in their grammar. Hervas was told by missionaries, that in the middle of the 18th c. the Araucans hardly used a single word which was not Spanish, though they preserved both the grammar and the syntax of their own native speech. This is the reason why grammar is made the criterion of the relationship and the base of the classification in almost all languages; and it follows, therefore, as a matter of course, that in the classification and in the science of language, it is impossible to admit the existence of a mixed idiom. We may form whole sentences in English, consisting entirely of Latin or Romance words; yet whatever there is left of grammar in English bears unmistakable traces of Teutonic workmanship. What may now be called grammar in English, is little more than the terminations of the genitive singular and nominative plural of nouns, the degrees of comparison, and a few of the persons and tenses of the verb. Yet the single *s*, used as the exponent of the third person singular of the indicative present, is irrefragable evidence that in a scientific classification of languages, English, though it did not retain a single word of Saxon origin, would have to be classed as Saxon, and as a branch of the great Teutonic stem of the Aryan family of speech.' See LANGUAGE.

In tracing the growth of the English language, the history is usually divided into *four* leading periods: the *Anglo-Saxon Period* (449 A.D.—1066 A.D.); the *Semi-Saxon Period* (from 1066 A.D.—1250 A.D.); the *Early English Period*, comprising the two periods of *Old* and *Middle English* (from 1250 A.D.—1550 A.D.); and the *Modern English Period* (from 1550 A.D. to the present time).

As early as the 5th c., Teutonic invaders from the continent settled in this country, and drove the original Celtic-speaking inhabitants to the north and west of the island; so that before the battle of Hastings (1066), the Anglo-Saxon tongue had been spoken in England for at least 600 years. The final absorption, after a long conflict, by the kings of Wessex, or West Saxons, of the various portions of the Heptarchy, in the 9th c., went far to make the ruling speech of the land identical with that of Berkshire and Hants, the recognised centre of the predominant sept. The use, besides, of this Southern Anglo-Teuton speech as the instrument of literary communication, was permanently confirmed by King Alfred, a native of Berks. Further back than the time of this literary monarch, few existing remains of the language permit us to go; yet, from the writings of Cædmon, who was a North Anglian, and a few ecclesiastical MSS. of the kingdom of Northumbria, which extended from the Humber to the Firth of Forth, it has been generally concluded that at least two dialectical peculiarities must have existed in the island—a northern and a southern one. The Anglian or Northern dialect, it has been presumed, was, to some extent, marked with Scandinavian features; while the Saxon or Southern dialect was more purely Low-Germanic, though the Anglian was also Low-Germanic in all essentials. Some have accounted for the partial approximation of the Anglian dialect to Scandinavian by the fact that the Danes, at a later period, effected a settlement in the north-east of England; but, on the other hand, it is argued that 'certain peculiarities of a Scandinavian character are to be found in the Anglian, even of a date anterior to the first Danish occupation of a part of England in the latter half of the ninth century.' Some philologers, again, insist on distributing the Anglo-Saxon language into more dialects than two; but it will be sufficient if the reader bear in mind the two which have been mentioned. Now, the question arises, which of the dialects of the Anglo-Saxon is specifically the parent of the English tongue? Two answers have been given to this question. It has been alleged that after the Norman Conquest, the classical Saxon of Wessex lost its temporary supremacy, and gradually gave way to a different dialect—namely, that of the Midland counties of England. This was the district where the universities sprung up, and where the rich monasteries and other religious foundations took their rise; and in support of this theory, it is argued by competent scholars, that the dialect which is most closely allied to the standard English of our day is that of Northamptonshire and some neighbouring counties. On the other hand, it has been maintained by no less an authority than Sir Frederick Madden, and his conclusion seems not unlikely, that we must look for the real groundwork of our language in a gradual coalescence of nearly all the leading dialects of England. See his edition of Layamon's *Brut*, 1847.

The period known as *Semi-Saxon*, in the history of our English tongue, dates from about the Conquest until near the middle of the 13th century. This was a transition era, and, like every era of the kind, one of confusion, both to those using the language, and to those desirous of tracing its history. The monks of the time, accustomed to the use of medieval Latin, had in a great measure forgotten the grammar of the Anglo-Saxon language; and when they attempted to write their mother-tongue, did so very badly. In fact, their language is just ungrammatical Anglo-Saxon, and very probably had its counterpart in the *usus loquendi* of the common people. The *Saxon Chronicle*, as it is called, which bears date 1173, and Layamon's *Brut*, about 1190 or 1200, exhibit traces of the breaking-up of the Anglo-Saxon. The inflections and genders of the substantives, the definite and indefinite declensions of adjectives, are for the most part disregarded; a marked partiality is shewn for weak preterites and participles; there is a constant substitution of *en* for *on* in the plurals of verbs; and the final *e* is often discarded; besides a great uncertainty prevailing in the government of prepositions. As regards the Semi-Saxon vocabulary itself, although employed in literature a century and a half after the Norman Conquest, it exhibits but few traces of Norman-French; proving beyond question, that the immediate effects of that great change were by no means so important on the Anglo-Saxon tongue as they were at one time believed to have been.

When we come to the *Early English Period*, we have escaped most of the perplexities which attach themselves to the Semi-Saxon era of our language. The principles of the English tongue now assert themselves actively in contrast with those of its Teutonic origin. The Anglo-Saxon was rich in inflections, which the English has contrived to get rid of. It prefers to express the various modifications of an idea by some relational word or words attached to the leading idea. During the Semi-Saxon period, as we have seen, the verbs suffered much less inflectional change than the substantives and adjectives; this will be found to hold throughout the entire 250 years of the era of reconstruction. In the fine poem of *The Owl and the Nightingale*, the Anglo-Saxon vowels *a*, *e*, *u*, in final syllables, are all represented by *e*, and the final *n* of the infinitive is beginning to disappear. In the Chronicle of Robert of Gloucester, we encounter, besides, a great number of French words, which had gradually become familiar to the people, through the presence of their Norman masters. The presence of French is, besides, very noticeable in the poetry of Chaucer and Gower. What fear could not accomplish, literary respect produced; for it is no doubt to the literary men of England, rather than to its masters, that we owe so large an admixture of French expressions and of French terminology. Our first complete translation of the Bible belongs to this period. *Piers Plowman* has but few French words, while Lydgate and Bishop Peacock have too many; and More's *Edward V.* (1509), and the *Nut Brown Maid* (1500), are comparatively modern in their style and tone. As to Scotland, again, in the Anglian counties lying south of the Forth, the language in all respects was similar to its more southern neighbour, and underwent such changes as we have noted in its more Saxon compeer. Barbour, a Scottish contemporary of Chaucer, wrote purer English than Chaucer did, and his poems resembled in a striking degree the homely phraseology of *Piers Plowman.* Regarding the north-eastern dialects of Scotland, some diversity of opinion exists. Some antiquaries are of opinion, that the large infusion of Norse or Scandinavian elements in these dialects is to be accounted for by the fact of a Norwegian kingdom having been maintained in the east of Scotland during the 11th c. for a period of thirty years; while others allege with more probability, that the language of the north-east of Scotland is as decidedly Anglo-Saxon in its form and substance as that of Norfolk or Yorkshire.

In the *Modern English Period*, says Professor Spalding, 'the organisation of the English language may be said to be complete. The laws determining the changes to be made on words, and regulating the grammatical structure of sentences, had been definitively fixed, and were generally obeyed; all that had still to be gained in this particular, was an increase of ease and dexterity in the application of the rules. The vocabulary, doubtless, was not so far advanced. It was receiving constant accessions; and the three-and-a-half centuries that have since elapsed, have increased our stock of words immensely. But this is a process which is still going on, and which never comes to a stop in the speech of any people; and the grammar being once thoroughly founded, the effects of glossarial changes are only secondary, until the time arrives when they co-operate with other causes in breaking up a language altogether.'—For further information, the reader is referred to such accessible works as those of Latham, Craik, and Spalding.

ENGLISH LITERATURE, like every other mental product, is qualified by the history of the nation to which it belongs. The great social eras of a country's history have always been found to correspond with the great intellectual eras of her growth. It will, however, be sufficient for our purpose to arrange the literary annals of England into three periods: 1. The period antecedent to the

Norman Conquest; 2. The period extending from the Norman Conquest to the English Reformation; and 3. The period extending from the English Reformation to the present day.

1. *The Period Antecedent to the Conquest.*—This period possesses a literature composed in three distinct languages—the *Celtic*, the *Latin*, and the *Anglo-Saxon*. Regarding the Celtic literature, see Celtic Nations, Irish Literature, and Welsh Literature. The introduction of Latin literature into this country was considerably later than the Roman invasion of it. The cultivation of the letters of Rome followed as a necessary consequence on the introduction of Christianity into the country. St Patrick is said to have been the first teacher of Christianity in the British Islands, some time before the middle of the 5th century. Ireland was the scene of his labours; and it is well known that it was by Irish missionaries, chief among whom was St Columba (q. v.), that the first light of the gospel was attempted to be disseminated in Scotland and the north of England. Towards the close of the 6th c., St Augustine landed in the south of England, and laid the foundations of the Anglo-Catholic Church. These great evangelists, however, rather prepared the way for literary effort on the part of others, than were themselves literary. The earliest names of importance that we encounter are Alcuin and Erigena, Bede and Alfred. After the immigration of the Anglo-Saxons into Britain, this people began to form a literature of their own. Their three historical poems—the Gleeman's Song, the Battle of Finnesburgh, and the Tale of Beowulf—are mainly versions of events which happened on the continent before the descent on the shores of England. The last, which is essentially a Norse tale, is the only poem resembling an Iliad which the Anglo-Saxons possess. Except the remarkable religious poems of the Northumbrian monk Cædmon, in the 7th c., little more of any moment in verse has been handed down to us by the Anglo-Saxon people. But this people, though comparatively poor in poetry, are eminently simple and straightforward prose writers. King Alfred discarded Latin in all his communications with his subjects, and in consequence the Anglo-Saxon made an impressive start throughout the whole of England. From the Saxon Chronicle, which is made up from the MS. of several conventual records, modern scholars have derived special and valuable information. Portions of the sacred Scriptures were translated into this language, several of the leading men of the time, such as Aldhelm, Bede, and Alfred, lending their assistance. Sermons and grammars, glossaries and medical treatises, geographies and dialogues between Solomon and Saturn, make up the file of this period of the literature. This notice of the *first* period must be concluded by an allusion to the illustrious name of Alfred, who, by his enlightenment and his virtue, has rendered the 9th c., in which he flourished, one of the brightest spots in the whole range of English literature. His favourite literary employment was rendering works written in Latin, a language which he only knew imperfectly, into his native tongue. He did not scruple to add a picturesque story, a bit of geography, or a devout prayer, when occasion suited, to the original text of his author. Even in his version of the last of the philosophic Romans, he sometimes vies with Boëthius in passages of solemn eloquence or of speculative meditation.

2. *The Period extending from the Norman Conquest to the English Reformation.*—The Conquest had the effect of changing the language and manners of the court; it took but little effect on those of the obstinate inhabitants of the country. In a few centuries, the English people compelled their Norman masters to acquire the despised Anglo-Saxon; and if there was a considerable importation of Norman-French into our literature, it was owing much more to such writers as Chaucer and Gower, who took what suited them from whatever quarter, than to any lordly influence of the Norman nobility domineering over the abject necks of their Teutonic enemies. In a generation or two after the Conquest, classical and theological learning made very considerable progress. Monasteries were busy, and the English universities were both by this time founded; while an interchange of teachers and pupils constantly went on between the English seminaries and those of France and other countries. Lanfranc and Anselm, Hales and Duns Scotus, Michael Scot and Roger Bacon, had attained to a great eminence in speculative and in physical philosophy. Doubtless their thinking was more characterised by its hair-splitting ingenuity than by its solidity, but the 13th c. stands out in a distinguished manner in England, and indeed throughout Europe, for its peculiar devotion to speculative studies. But all these philosophers wrote in Latin, and so did the historical writers of the time. These were William of Malmesbury, Geoffrey of Monmouth, Giraldus Cambrensis, Matthew Paris, and other chroniclers. One of the most curious and amusing phases through which our literature passed was the composition of local squibs, generally of a personal character, in rhymed Latin couplets. The ecclesiastics frequently came in for more than their share of this rude abuse. It is to Walter Mapes, a man of wit and fancy, we owe a highly popular drinking-song of this period, beginning *Mihi est propositum in taberna mori* ('I devise to end my days in a tavern drinking;' see Leigh Hunt's felicitous translation), which almost rivals in spirit and vigour the *Jolly Good Ale and Old* of two centuries later. The satire passed from the clergy, and was directed against the feeble king (John). De Montfort and the other great barons who distinguished themselves at Runnymede, are the universal theme of popular praise. The *Gesta Romanorum*, a medley of the most dissimilar elements, compiled by nobody knows who, contain tales and apologues, fables and satires, stories of pathos and of humour, worked up into a form closely resembling the French Fabliaux. These *Gesta* have been instrumental in suggesting some of the noblest themes to our more recent literature, and thus possess double claims on our affectionate regard. *The Merchant of Venice*, *Marmion*, &c., owe much to these rude tales of a bygone age. The French Fabliaux affected our literature but little before the time of Chaucer. Except the productions of a poetess, Marie of France, few of these compositions have come down to us of very great merit. The romances of chivalry, rude and spirited, pathetic and imaginative, are well worth the attention of the student of English literature; such are the fine old story of *Havelok the Dane*, the *Gest of King Horn*, *Bevis of Hamptoun*, *Guy of Warwick;* and last and best of all are those romances written in French, but composed by Englishmen, that celebrate the glory and fall of King Arthur and his knights of the Round Table, of which splendid use has recently been made by Alfred Tennyson in his *Idylls of the King*. But what during all this time has become of the old vernacular tongue of England as a medium of literary expression? Driven from the monasteries and universities, for the most part, and only slightly retained in poetry, it might have been expected to decay and die out. But such was the native vitality of the people who spoke it, that it kept its place,

almost without a literature, only undergoing such changes as time inevitably effects upon a nascent language. Thus the Anglo-Saxon merged into the Semi-Saxon, which grew and flourished, although it contains very little literature of much importance, except the *Brut* of Layamon, 'the English Ennius.' The 14th and 15th centuries (the period of the Early English) are of great importance, both in the progress of English history and of English literature; for although the age of Edward II. was inglorious in both, yet in the next reign the victories of Crecy and Poitiers heralded as with trumpet-blast the age of thought and of poetry, represented by Wickliffe and Chaucer, both of them brave-hearted genuine Englishmen. The translation (the first ever executed) of the Bible into English, which was completed by Wickliffe about 1380, is a work of great value, not only as a monument in the religious history of our nation, but in a philological point of view, being, as it is, 'all but first among the prose-writings in our old tongue.' The principal book which precedes it, and the very oldest written in Early English, is Sir John Mandeville's account of his eastern travels (1356). Somewhat later (between 1390 and 1400), Geoffrey Chaucer, the genuine father of English poetry, published his *Canterbury Tales*. A shrewd and sagacious observer, he has left behind him in these *Tales* a series of sportive and pathetic narratives, told with such a wonderful power of tenderness and humour, in such a simple, healthy style (although his English is largely modified by French innovations), that they have been the wonder and delight of all succeeding times. Laurence Minot, Richard Rolle, Langland or Longlande, author of *Piers Plowman*, and Gower, fitly close round Chaucer as contemporaries who wrote more or less vigorous verse. About the same period flourished in Scotland John Barbour, whose epic narrative, *The Bruce*, was written about 1376. The language of this poem resembles that contemporaneously employed in the south. In the following c. (the 15th), and in the early part of the 16th, occur in England the names of John Lydgate (1430), whose *London Lyckpenny* is still agreeable reading; Alexander Barclay, whose *Ship of Fools* was printed in 1509; John Skelton, author of the scurrilous satire of *Colin Clout* (died 1529); Howard, Earl of Surrey (beheaded 1546—1547); and Sir Thomas Wyatt (died 1541). The prose writers of this period are Sir John Fortescue, chief-justice of the King's Bench under Henry VI., who flourished 1430—1470, and who wrote, among other things, a tract on the *Difference between an Absolute and Limited Monarchy, as it more particularly regards the English Constitution;* William Caxton, who introduced printing into Britain in 1474—the first book ever printed in this country being the *Game of Chess;* Fabian, author of the *Concordance of Stories*, died 1512; Hall, an English lawyer (died 1547), who wrote a chronicle of the *Wars of the Roses;* and Tyndale, burned (1536) for heresy. In Scotland, during the same period, we encounter in poetry the names of James I., king of Scotland (murdered 1437), author of the *King's Quhair*, &c.; Andrew Wyntoun, prior of Lochleven, whose *Orygynale Cronykil of Scotland* was completed about 1420; Blind Harry, author of *The Adventures of William Wallace*, a work written about 1460, and long exceedingly popular with the Scottish peasantry; Robert Henryson (died 1508), author of *The Testament of Cresseid*, &c.; William Dunbar (died about 1520), whose *Dance of the Seven Deadly Sins* shews him to have possessed great boldness and vigour in his delineations of character; and Gavin Douglas (died 1522), whose best work is a translation of Virgil's *Æneid* into Scottish verse.

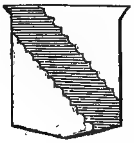
3. *The Period extending from the English Reformation to the Present Day.*—Among the brilliant works of the Elizabethan age, there is probably none of which we may not detect germs in some of the efforts which were made in the century that preceded. In theology, the names of Latimer (burned 1555), of Cranmer (burned 1556), and of Ridley (burned 1555), shine forth conspicuously; and it is sufficient to mention Sir Thomas More (beheaded 1535), author of *Utopia,* a curious philosophical work, and Roger Ascham (died 1568), as excellent miscellaneous writers of that time. As we have already taken up the English drama under the article Drama, we need only mention here Sackville (died 1608), author of *Mirrour for Magistrates*, &c.; Brooke (drowned 1563), author of the *Tragical History of Romeus and Juliet;* and the Scotchmen, Sir David Lyndsay, Lyon King-at-arms (died about 1557), Boece, Major, Melville, and, above all, George Buchanan (died 1582), who is universally admitted to have been one of the finest classical scholars that ever appeared in Christendom. The founding of the Scottish universities, and the dissemination, mainly through the influence of the great reformer John Knox, of grammar and parish schools throughout the country, bade fair to give to Scotland an important place in the literature of Great Britain; a result which unforeseen ecclesiastico-political troubles long frustrated. The era on which we are next to look, the Elizabethan, is the most brilliant in the literary history of England. We may quote here the words of Lord Jeffrey: 'In point of real force and originality of genius, neither the age of Pericles, nor the age of Augustus, nor the times of Leo X., or of Louis XIV., can come at all into comparison. For in that short period we shall find the names of almost all the great men that this nation has ever produced; the names of Shakspeare, and Bacon, and Spenser, and Sidney; of Raleigh, and Hooker, and Taylor; of Napier, and Milton, and Cudworth, and Hobbes; and many others—men, all of them not merely of great talents and accomplishments, but of vast compass and reach of understanding, and of minds truly creative; not men who perfected art by the delicacy of their taste, or digested knowledge by the justness of their reasonings; but men who made vast and substantial additions to the materials upon which taste and reason must hereafter be employed, and who enlarged to an incredible and unparalleled extent both the stores and the resources of the human faculties.' Even the minor dramatists of the time, such as Marlowe and Chapman, Beaumont and Fletcher, Jonson and Drummond, are all nearly the equals of any succeeding poets that have appeared. In the latter half of this period a new class of poetic writers started up, who were lyrical rather than dramatic, and whose occasional verses, sometimes descriptive, sometimes amatory, and sometimes religious, are characterised by a bright and delicate fancy, as if morning sunbeams glittered on their pages. These are George Wither, William Browne, Frances Quarles, and George Herbert, 'the sweet psalmist of the 17th century' (as Emerson calls him). The last forty years of the 17th c. are generally known as the age of the Restoration and the Revolution. During this period, the literature of the stage was disgraced by its indecency. Charles II. and his court had brought back with them from France a love of polite profligacy, which found its most fitting expression in the comedy of intrigue. Four names stand out conspicuous as 'sinners above all men in that generation'—Wycherly, Congreve, Vanbrugh, and Farquhar. Yet theology could boast of such names as Baxter,

Owen, Calamy, Collier, Leighton, South, Tillotson, and Barrow. This was also the epoch when the great Milton, driven into the shades of obscurity by political adversities, fulfilled the uttered hope of his youth, and wrote 'something which posterity will not willingly let die.' About this time, too, Walton angled, and Butler burlesqued dissent; Marvell turned his keen irony against the High Church; Locke and Newton speculated and discovered; and John Dryden, the literary chief of the time, 'found the English language (according to Dr Johnson) of brick and left it of marble.'

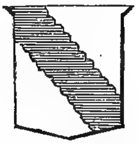
The literary history of the 18th c., and of the reign of Queen Anne, has been variously estimated. If it was overvalued by those who lived in it, and in the age that succeeded, it has assuredly been undervalued in our own day. It was long glorified as the Augustan age of English literature; but among ourselves it has been set aside as a sceptical, utilitarian age, when poetry could find no higher field than didactic discussion, and prose found nothing to amuse but comic and domestic narrative, or bitter and stinging satire. The truth, as usual, lies in the middle. This age was far from being superior to every era that had gone before it, and it was not quite so low as some of its hostile critics have represented. One thing, however, is beyond dispute, viz., that the *form*, both in poetry and in prose, had come to be much more regarded than the *matter*. Addison, Swift, and Johnson, may be taken as types of the prose writers of this century. The first for ease and grace is unmatched in any age; the second stands equally high for rough and pointed vigour; and the third is famous for his ponderous, finely balanced sentences, the dignity of which not unfrequently surpassed the sense. The poetry of the time is represented by Pope, and it has been gravely asked whether he was a poet at all. He certainly versified with brilliant elegance, and the terror which his polished epigrams excited in the breasts of his enemies, shewed him to possess a force of genius which at least demands our admiration. Young and Akenside were perhaps animated by a higher poetic sense, but they accomplished much less; and the same may also be said of Thomson, Gray, Collins, Beattie, and Cowper. Incomparably the greatest poet, however, of the 18th c. was Robert Burns. Richardson, Fielding, Smollett, Sterne, Goldsmith, and Mackenzie are its novelists; Hume, Robertson, and Gibbon, its historians; Butler, Berkeley, Clarke, Shaftesbury, Hume, Paley, and Adam Smith its philosophers.

The 19th c., though full of interest for us, is, from the novelty and the variety of the intellectual character employed in it, one of the most difficult to analyse of the whole range of English literature. It has been a time of extraordinary activity, books have been multiplied to an unprecedented degree, and readers have increased in an equal proportion. It cannot be doubted, however, that the first quarter of this century is greater in literature than any subsequent portion of it. It is greater, besides, in poetry than in prose. The early names of Coleridge and Wordsworth, of Scott and Byron, of Shelley and Keats, of Campbell and Southey, are higher than any now prominent except that of Tennyson. This is the age, besides, of novels and romances, of reviews and periodicals. Jeffrey and Sydney Smith, Hazlitt and John Foster, De Quincey and Carlyle, are the great names in review-literature; Hall, Chalmers, and Irving in pulpit oratory; Stewart, Mackintosh, Bentham, Brown, Hamilton, and Mill in philosophy; Dickens, Thackeray, Bulwer Lytton, Miss Bronte, and Miss Evans, as novelists; Hallam, Macaulay, Thirlwall, Grote, Milman, and Carlyle, as historians; Ruskin, as a writer on art; Tennyson, the Brownings, Matthew and Edwin Arnold, Dobell, and Smith, as poets; and in the New World beyond the Atlantic, Washington Irving, Poe, Longfellow, Cooper, Prescott, Emerson, Bancroft, and Hawthorne, with many more, rise before the mind when one tries to seize upon the great living authors of this age or those recently dead. A considerable portion of the literature of the 18th and 19th centuries is devoted to science, which can shew a crowd of illustrious names too numerous to mention. Besides, in scientific works, the *matter* is of so much greater importance than the *form*, and so little attention is paid in general to the latter by scientific writers, that it is not customary to include them in a survey of literature proper.

ENGRAI'LED, in Heraldry, a line composed of a series of little half-moons, or semicircles, supposed to have been made in it by hail. Engrailed is the opposite of invected.



Engrailed.



Invected.

ENGRA'VING, in its widest sense, is the art of incising designs, writing, &c., on any hard substance, such as stone, metal, or wood. Many branches of the art are of great antiquity; such as gem-engraving, cameo-cutting, and die-sinking. The more important of these ornamental and useful kinds of engraving are described under their proper heads. But in a narrower sense, engraving is the special designation of the art of cutting or indenting the surface of metal plates or of blocks of wood with designs, for the purpose of taking off impressions or *prints* of the designs on paper. This department of the art arose as late as the 15th c., the earliest wood-engraving with a date being 1423, and the earliest dated engraving from a metal plate being 1461.

Wood-engraving differs from engraving on metal in this, that on a metal plate the traces or marks which are to appear on the paper are cut or sunk into the plate, and when printed from are filled with ink, while the rest of the surface is kept clean; whereas in wood-engraving they are left prominent or in relief, and the blank parts of the design are cut away. Hence a wood-cut acts as a *type*, and is inked and printed from in the usual way. See PRINTING. This makes wood-engraving peculiarly suitable for the illustration of books; as the blocks can be printed from along with the letterpress; while the impressions from a metal plate must be taken by themselves, and by a slow process. The further treatment of the important art of WOOD-ENGRAVING is reserved for a separate article; our attention at present being confined to engraving on metal.

It is beyond our scope to enter into the practical details of the various processes; we can only aim at enabling a reader altogether ignorant of them to conceive how the effects may be produced, and to understand the terms currently used in speaking of this kind of art.

The metals most commonly used for engraving are copper and steel, the former having the advantage of being more easily worked, the latter of greater durability. The processes of working are essentially the same in both. The several manners or styles of engraving are distinguished as Line-engraving, Mezzotinto, Stippling, and Aquatinta.

1. *Line-engraving*—in which, as the name implies, the effect is produced by a combination of lines—is executed either by direct incision with the graver or the dry-point, or by a combination of incision with *etching*—a chemical process to be immediately described. The *graver* or *burin* is usually in the form of a quadrangular prism, fitted into a short handle. In making the incision, the graver is pushed forward in the direction of the line required, being held by the handle, at an angle very slightly inclined to the plane of the copper. A *scraper* is required to scrape off the barb or burr which is formed by the action of the graver and dry-point. The *rubber* is a roll of cloth dipped in oil, and is used to make the surface smooth. A *burnisher* is required to polish the plate, and erase any scratches which it may accidentally receive, and also to make lighter any part of the work which may have been made too dark. The *dry-point* is like a sewing-needle fixed into a handle, and is used to cut or scratch the finer lines. The graver cuts the copper clean out, the dry-point throws it up on each side; and in some cases this is not scraped off, but made use of till it is worn off, as it gives richness to the line.

In etching, the first step is to cover the plate with a composition of wax, asphaltum, gum mastic, resin, &c., dissolved by heat; an outline of the design, made on paper in pencil or red chalk, is then 'transferred' to the surface of this composition, by being passed through a press. The subject is then drawn on the ground with the etching-point, which cuts through it, and exposes the copper. *Etching-points* or *needles* resemble large sewing-needles shortened, and fixed into handles four or five inches long; some are made oval, to produce broader lines. A rim of wax being put round the plate, acid is poured on, and corrodes the copper not protected by the ground. If the acid is found not to have acted sufficiently, it may be applied again to the whole design, or only to portions of it, by *stopping up*, with a mixture of lampblack and Venice turpentine applied with a camel-hair pencil, what has been sufficiently *bitten in.*

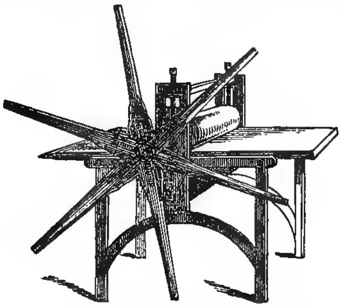
When a series of parallel lines are wanted, as in backgrounds, &c., an ingenious machine called a ruler is employed, the accuracy of whose operation is exceedingly perfect. This is made to act on etching-ground by a point or diamond connected with the apparatus, and the tracings are bit in with aquafortis in the ordinary way.

2. The process of *mezzotinto* is by no means so difficult as line-engraving. The plate is prepared by being indented or hacked all over by an instrument with a serrated edge, called a cradle, which is rocked to and fro upon it in all directions. The barb or nap thus produced retains the printer's ink, and if printed, a uniform dark surface would be the result. On this plate, after a tracing has been transferred, the engraver goes to work with tools called scrapers and burnishers—those parts of the ground most smoothed being the highest lights, and the ground the least operated on producing the deepest shadows. As the work proceeds, it may be blackened with ink, applied with a printer's ball or otherwise, in order to ascertain the effect. The design is sometimes etched on the plate by the ordinary process, before the mezzotinto ground is laid.

3. *Aquatint Engraving.*—By this method, the effect of drawings in Indian ink is produced; and at one time it was greatly made use of in rendering the drawings of Paul Sandby and our early water-colour painters, and particularly prints for drawing-books. In this process, which is a very complex kind of etching, the ground, which is composed of pulverised rosin and spirits of wine, assumes when dry a granulated form; and the aquafortis acting on the metal between the particles, reduces the surface to a state that an impression from it resembles a tint or wash of colour on paper. David Allan engraved his celebrated illustrations of the *Gentle Shepherd* in this manner. It has now gone almost entirely out of use, having, like engraving in imitations of drawings in chalk or pencil, been in a great degree superseded by lithography.

4. In engraving in *Stipple*, which was much in vogue in the end of the last century, the drawing and effect are produced by small dots, in place of lines. Ryland, Bartolozzi, and Sherwin, excelled in this style. It is well suited for portraits; several of Raeburn's have been capitally engraved in stipple by Walker. It involves much more labour than mezzotinto, and is now little practised.

Plate-printing.—Copper-plates, engraved in any of the above styles, are ready for press as soon as they are finished by the engraver. The method of printing from them is very simple. Their engraved surface is daubed over with a thick oleaginous ink, so that the lines are effectually filled. As this dirties the whole face of the plate, it is necessary to clean it, which is done by the workman wiping it first with a piece of cloth, and then with the palms of his hands, rubbed on fine whiting. It may be calculated that a hundred times more ink is thus removed than actually remains in the indentations; however, such is necessary. The plate being thoroughly cleaned, it is laid on a press (see fig.), with a piece of damped paper over it; and being wound beneath a roller covered with blanket-stuff, it is forced to yield an impression on the paper. The plate requires to be kept at a moderate warmth during the operation. The frequent rubbing of the plate with the hand to clean it, as may be supposed, tends greatly to wear it down; and such is the wear chiefly from this cause, that few copper-plates will yield more than a few thousands of impressions in good order. The earliest, called *proofs*, are always the best and most highly prized.



In consequence of this defect in copper, the practice of *engraving steel-plates*, for all subjects requiring a great many impressions, has now become very common. This process was introduced by the late Mr Perkins of London, who originally softened the plates, engraved them, and then rehardened them—a practice now abandoned, as ordinary steel-plates can be worked upon by the burin, dry-point, scraper, and burnisher with perfect facility. Etching on steel-plates is executed much in the same way as in the process on copper. An engraving on a steel-plate may be transferred in relief to a softened steel cylinder by pressure; and this cylinder, after being hardened, may again transfer the design by rolling it upon a fresh steel-plate; and thus the design may be multiplied at pleasure.

History of Engraving.—This most important invention, by which the productions of art are diffused without limit, is said to have been accidental, and is claimed for Tommaso Finiguerra, who first took impressions on paper about the year 1440. His employment was executing ornamental engraving, chiefly on articles used in religious services, such as small portable shrines, or altar-pieces. These were generally made of silver, and the designs engraved on them were filled up with a black composition, that hardened in a short time. This composition was called in Italian *niello* (from Lat. *nigellus*, dim. of *niger*, black), and the workers in it *niellatori*. It was the practice of Finiguerra, in the course of executing his work, to prove it by rubbing lampblack and oil into, and pressing paper over it; he thus obtained an impression of his work up to a particular stage, and was enabled safely to carry it on till it was completed. Finiguerra's title to the invention has been disputed; and in a recent work by J. D. Passavant, *Le Peintre-Graveur* (Leip. 1860), a strong case seems to be made out for its German origin. Be that as it may, the principal early Italian engravers who followed Finiguerra, were Bacio Baldini (born about 1436, died 1515); Sandro Botticelli (born 1437, died 1515)—he embellished an edition of Dante's *Inferno*, brought out in 1481; Antonio Pollajuoli (born 1426, died 1498, at Florence); Andrea Mantegna (born at Padua 1431, died at Mantua 1505); and Marc Antonio Raymondi (born at Bologna 1487 or 1488, died 1539), who executed his chief works at Rome. The most celebrated early German engravers were Martin Schoengauer (born at Colmar about 1455, died 1499); Israel van Mecheln, or Meckenen (born at Meckenen on the Meuse about 1450, and died 1523); Michel Wohlgemuth, who died in 1519; Albert Dürer (born at Nürnberg in 1471, died in 1528); and Lucas van Leyden (born at Leyden 1494, died 1533). The engravings of all these artists are very valuable, not only from their scarceness, and as illustrating the early history and progress of the art, but as exemplifying many high qualities that have never been surpassed in later times. The most of them were painters, and engraved their own works, except Marc Antonio, who engraved chiefly those of Raphael, by whom he was employed, and who occasionally overlooked and directed him. All those engravers, and their immediate followers, executed their works with the graver; but soon after, engravings came to be generally executed by two processes—etching, and cutting with the graver or the dry-point. The works of these early masters are often remarkable for character and expression, as those, for instance, by Mantegna; and for the correctness and high style of the drawing, for which qualities Marc Antonio has never been surpassed; also for finish of the most careful and elaborate kind, which has been carried further by Albert Dürer and Lucas van Leyden than by any other engravers. The styles of these early engravers were cultivated by numerous successors, several of whom followed their masters as closely as they could, while others diverged into something like originality: the chief names are Agostino Veneziano, about 1620; Nicolas Belin da Modena, and Giov. Ghisi, 1630; Luc. Damesz, who died in 1533; Giov. Giac. Caraglio, and Marco da Ravenna, about 1640; Giul. Bonasone, born at Bologna in 1498, died in Rome in 1564; Eneus Vicus, George Vens, Henrid Aldegraf, and Jean Sebast. Bœhm, about 1550; Adrian, Charles, William, and John Collert, Adam and George Ghisi, Sutermann, Virgilius Solis, Cornelius Cort, Martin Rota, and others, ranging from the middle to the end of the 16th century. Agost. Caracci, the celebrated painter, executed many spirited engravings. Saenredam, De Bruyn, Galle, Kellerthaller, Alberti, De Goudt, C. de Pass, Sadeler, are names of well-known engravers that enter on the 17th century. Henry Goltzius is noted for the number and variety of his works, and his imitations of the styles of the older masters. In the plates of engravers towards the middle of the 17th, and beginning of the 18th c., a large proportion of the work consists of etching, the graver being chiefly used for deepening and clearing up the etching. This arose from the manner of working being well adapted for rendering the style of the painters of that period, whose works were distinguished for freedom of execution or touch, and clearness and transparency. The most noted engravers of this period were the Vischers, who flourished between 1610 and 1650, and engraved many of Berghem's pictures; Bolswert, 1620; Lucas Vosterman the Elder, 1630; Suyderhoef, about 1640. These engravers rendered many of the works of Rubens in a very spirited manner. Coryn Boel—whose engravings from Teniers are in some respects superior even to Le Bas—Troyen, and Van Kessel, are worthy contemporaries.

In the age of Louis XIV., a race of engravers of portraits arose, who carried execution with the graver almost to perfection. The works of the artists they engraved from were florid in style, with a great display of drapery and lace, and accessories in the backgrounds elaborately executed. Among these engravers the following rank highest: Gerard Edelinck (b. Antwerp 1627, d. Paris 1707)—he was one of the best engravers of the period, and specially patronised by Louis XIV.; Masson (b. 1636, d. 1700); Larmessin (b. 1640, d. 1684); Drevet the Elder (b. 1664, d. 1739); Drevet the Younger (b. 1697); Gerard Andran (b. 1640, d. 1703). There was a large family of Andrans engravers, but Gerard was the most celebrated, indeed he was one of the best of the French engravers. Among engravers of talent in England may be mentioned Robert Walker (b. 1572); William Faithorne (b. London between 1620 and 1630, d. 1694) executed many excellent engravings of portraits; George Vertue (b. London 1684, d. 1756), a good engraver, and a man of general information and taste in matters of art; John Smith (b. London 1654, d. 1722) executed in mezzotinto a vast number of interesting portraits. In the 18th c., there were numerous excellent engravers, by whose works the taste for the pictures of the Dutch school of the 17th c. has been widely extended. Two of the most distinguished of these were John Philip le Bas (b. Paris 1708, d. 1782) and John George Wille (b. Königsberg 1717, d. 1808). Their styles are totally dissimilar. Le Bas's plates are chiefly etched, and remarkable for spirit and sharpness of touch and transparency; accordingly, mostly all his works are after painters who excelled in these qualities, particularly Teniers. Wille's engravings, again, are of the most careful and elaborate description, and his best prints are after Gerard Dow, Terburg, Mieris, and Metzu—masters distinguished for the high finish of their pictures. He worked with the graver; and his plates are distinguished by the precision and clearness with which the lines are cut.

It was about the middle and latter portion of last century that engraving reached its highest point in England. The works of William Hogarth (b. London 1698, d. 1764) are of world-wide celebrity, but that is owing mainly to the excellence and dramatic interest of the pictures from which the engravings are made, though, no doubt, his prints are engraved in a firm clear style, similar to that practised by the French engravers of the time, several of whom were employed by him. It was Sir Robert Strange (b. Orkney 1721, d. London 1792), an engraver of figures, and William Woolet (b. Maidstone 1735, d. London 1785), a landscape-engraver, who imparted to English engraving those qualities and characteristics that enable us to claim a style of engraving that is national, differing from other styles, and that has arisen and been best carried out in this country. In drawing and form, Strange was rather defective; but he excelled in what engravers call colour, or the art of producing, by means of variety of line, a texture or quality that compensates for the want of colour, by giving to the engraving something of the richness produced by colour in a picture. His imitation of the softness and semi-transparency of flesh was particularly successful, and superior to that of the French engravers, whose works, though in most respects admirable, failed in that respect, and had, in the more delicate parts, a hard or metallic look. Woolet treated landscape-engraving in a manner totally new, imparting to it more firmness and decision, by making great use of the graver. His works have more finish and force than former landscape-engravers, but they are in some degree liable to the objection of hardness, in the treatment of foliage in particular. The works of these two engravers have had a marked influence on art, not only in this country, but abroad. The merit of Strange's style was acknowledged on the continent; he was elected a member of the Academies of Florence, Bologna, Parma, and Rome. At the end of last century, art had fallen very low on the continent, but a regeneration was beginning; and in Italy, engravers were then arising, such as Volpato and Cunego, who studied and imitated the softness and, technically speaking, fleshiness of texture that distinguished the works of the British engraver; those, again, were followed by Raphael Morghen, Longhi, Mercurii, and others, in Italy; by Boucher Desnoyers, Forster, &c., in France; and by Müller, Keller, Gruner, and numerous other engravers in Germany. By them, engraving has been carried to the highest pitch. Amongst their works, the following are *chefs-d'œuvres:* 'The Last Supper,' after Da Vinci, by R. Morghen; the 'Spozalizia,' after Raphael, by Longhi; 'La Belle Jardinière,' and other works, after Raphael, by Boucher Desnoyers, who has engraved the works of Raphael perhaps on the whole better than any other engraver; 'The Madonna de San Sisto,' by Müller, and 'The Dispute on the Sacrament,' after Raphael, of Keller. No engravings executed in this country come up to the works of these last-named masters, who have engraved works of a higher class than the majority of those done by Strange, while the drawing and general treatment of their works are in a purer and more correct style. However, the engravings of Burnet, Raimbach, Stewart, and others after Wilkie and contemporary British painters, deservedly hold the highest place among works of the class to which they belong, and betoken clearly the great influence which Strange exercised on their style. At present, few figure-subjects are executed in the line-manner, and that art has certainly fallen in this country. This may be accounted for, perhaps, by the great use made of mechanical appliances, in portions of the work, to save time, and by the preference shewn for mezzotinto-engraving as practised at present, that is, with a mixture of lining or stippling. The greater number of Landseer's works have been engraved in that way, and it is now adopted for rendering the works of John Phillip and Millais, and the leading artists of the day. Several, however, of Landseer's earlier works have been engraved in the line manner, particularly his pictures of 'Drovers leaving the Grampians,' and 'The Watering-place,' by Watt, which are capital examples of line-engraving. There is no good modern school of landscape-engraving on the continent; the influence of Woolet was entirely confined to this country, where landscape-engraving, particularly in illustrated works after Turner, has attained great excellence.

Towards the end of last century, mezzotinto-engraving was practised in England with great success; arising from its being peculiarly adapted to render effectively the works of Sir Joshua Reynolds. M'Ardell, Earlom, Watson, Smith, Valentine Green, and Ward were among the best engravers of his works. The invention of this process is generally given to Prince Rupert, others ascribe it to Dr Wren, 1662, and state that Prince Rupert merely improved on the invention. It has been practised very generally from the time of its invention, but attained its highest position in Sir Joshua's time; and it is very successfully carried out now, in an altered manner, additional force being aimed at, by means of stippling and etching. It is well calculated for producing broad effects: Turner's *Liber Studiorum*, and the landscapes after Constable, are admirable examples of its capabilities in this way; the effect in Turner's plates, however, is heightened by etching.

Etching has been already described as a part of the process of engraving; but as practised by painters, it is classed as a distinct art. The plate is prepared with a ground, and corroded in the same way; but the treatment is more free. Not being tied to the task of literally copying or translating the idea of another, like the engraver, the painter has scope to impart a spirit to his work peculiarly suggestive of what he intends to embody; his idea is represented directly, and not at second-hand, as it were. The etchings of Rembrandt, Paul Potter, Karl du Jardin, Adrian Vandevelde, Teniers, Ostade, Berghem, Backhuysen, Van Dyck, Claude, Salvator Rosa, Canaletti, and other painters, are very highly valued, as conveying more completely the feeling of the painter than the best engravings. Etching was more practised by the old than by modern painters; yet Wilkie, Landseer, and other modern artists, have etched various plates, remarkable for character and spirit.

English Works on Engraving—*Sculpture, or the History and Art of Chalcography and Engraving on Copper*, by John Evelyn (Lond. 12mo, 1663; 8vo, 1755); *The Art of Engraving and Etching, with the Way of Printing Copper-plates*, by M. Faithorne (Lond. 1702); *Sculptura Historico-technico, or the History and Art of Engraving, extracted from Baldinucci Florent, Le Compt, Faithorne, the Abecadario Pittorico, and other authors* (Lond. 4to, 1747, 1766, and 1770); *An Essay upon Prints*, by Gilpin (Lond. 8vo, 1767, 1768, and 1781); Strutt's *Biographical Dictionary of Engravers* (2 vols., 4to, Lond. 1785); Landseer's *Lectures on Engraving* (8vo, Lond. 1806); *An Inquiry into the Origin and Early History of Engraving upon Copper and on Wood*, by William Young Ottley (4to, Lond. 1816).

Of late years, many inventions have been introduced, having for their object to supersede the slow and laborious manual operations of engraving by means of machinery and other appliances. It is, however, to business and ornamental purposes that they are applicable, and not to the production of artistic engravings of the kind treated of in this article. The subject will be noticed under MACHINE ENGRAVING, MEDALS, GLASS, &c. With regard to the reproduction of plates, and other applications of galvanic electricity to engraving, see GALVANISM and MAGNETO-ELECTRICITY. See also PHOTOGRAPHIC ENGRAVING.

ENGRAVINGS, PROPERTY OF. The property of engravings and prints is secured by statutes similar to those for the protection of literary property. By 8 Geo. II. c. 13, the property of historical and other prints was declared to be invested in the inventor for 14 years. The proprietor's name must be affixed to each print, and the statute imposes a penalty on printsellers and others pirating the same. The provisions of this statute were extended by 7 Geo. III. c. 38, which secures to the widow of William Hogarth the sole right of printing and reprinting his works for the period of 20 years. The other acts are 17 Geo. III. c. 57, 6 and 7 Will. IV. c. 59—which extends the former acts to the whole United Kingdom—and 15 Vict. c. 12. The latter act—the object of which was to enable her Majesty to carry into effect a convention with France on the subject of copyright, to extend and explain the international copyright acts, and to explain the acts relating to copyright in engravings—reduces the duties on foreign engravings, and extends the protection of the acts to prints taken by lithography, or 'any other mechanical process by which prints or impressions of drawings or designs are capable of being multiplied indefinitely'—a clause which has now been found to cover photographs.

ENGRO'SSING AND REGRA'TING. An engrosser, regrater, or forestaller, is a person who buys grain, flesh, fish, or other articles of food, with the intention of selling them again at an enhanced price, either in the same fair or market, or in another in the neighbourhood, or who purchases or contracts for corn while still in the field. These practices were regarded as criminal in most countries, before the laws by which trade is regulated were properly understood. In England, they were forbidden by various statutes, from the time of Edward VI. to that of Queen Anne. These statutes were repealed by 12 Geo. III. c. 71, on the preamble, that it hath been found by experience, that the restraints laid upon the dealing in corn, meal, flour, cattle, and sundry other sorts of victuals, by preventing a free trade in the said commodities, have a tendency to discourage the growth, and to enhance the price of the same. It was found, however, that engrossing was not only a statutory but a common law offence, and a prosecution for it in the latter character actually took place in the present century. The Act 7 and 8 Vict. c. 24, for abolishing the offences of forestalling, regrating, and engrossing, was consequently passed. Besides declaring that the several offences of badgering, engrossing, forestalling, and regrating be utterly taken away and abolished, and that no information or prosecution shall lie either at common law or by virtue of any statute, either in England, Scotland, or Ireland, this statute repeals a whole host of earlier enactments in restraint of trade, which had been omitted in the statute in the time of George III., above referred to. The rubrics of these enactments give a curious picture not only of the trading errors, but in many other respects of the obsolete customs of our ancestors. The first, for example (51 Henry III.), is called a 'Statute of the Pillory and Tumbrel, and of the Assize of Bread and Ale.' Then there is an act passed in several reigns which provides for the punishment of 'a butcher or cook that buyeth flesh of Jews, and selleth the same to Christians.'

Notwithstanding the doctrine of the Scottish law, that statutes may be repealed by mere desuetude, it was thought safer to include the Scottish statutes to the same effect. The earliest is 1503, c. 38, and the latest 1661, c. 280.

The statute 6 and 7 Vict. c. 24 does not apply to the spreading of false rumours, with the intent to enhance or decry the price of merchandise, or preventing goods from being brought to market by force or threats, which continue to be punishable as if that act had not been made.

ENGROSSING A DEED. See INGROSSING.

ENGUE'RA, a town of Spain, in the province of Valencia, 43 miles south-west of the town of that name. It is poorly built, and has narrow and irregular streets. It has manufactures of linen and woollen goods, and some trade in cattle and agricultural produce. Pop. 5250.

ENGUICHÉ. A hunting-horn, the rim around the mouth of which is of a different colour from the horn itself, is said heraldically to be enguiché, of the colour in question.

ENHARMO'NIC, a term applied in Music when the name of a note is changed without any sensible difference of sound, such as C♯ and D♭, F♯ and G♭. Correctly speaking, there is, or ought to be, a difference; but on keyed instruments, such as the organ and pianoforte, there can be none, as the same key serves for both sharp and flat, while with a just equal temperament the ear is in no way offended. In harmony, the principal seat of enharmonic change is in the chord of the diminished seventh, which, by a change of the notes, may be treated fundamentally in four different ways, without any sensible difference in the intonation.

ENKHUI'SEN, a fortified town and seaport of the Netherlands, in the province of North Holland, is situated on the western shore of the Zuider Zee, about 30 miles north-east of Amsterdam. It is built with great regularity, and is of a circular form. The most important public building is an elegant town-house, surmounted by a lofty tower. There are also numerous ecclesiastical edifices, several salt-refineries, ship-building yards, and a cannon-foundry. Formerly, E. was a town of some importance—400 vessels used to leave its harbour annually for the herring-fisheries; at present, not more than 7 vessels are thus employed. It has still some trade in butter, cheese, timber, cattle, and fish. Pop. 5400.

ENLI'STMENT, in the Army, is the chief mode by which the English army is supplied with troops, as distinguished from the CONSCRIPTION prevailing in many other countries. Enlistment was in private hands until the year 1802, middlemen procuring recruits, and receiving a profit or commission for their trouble. This system being subject to much abuse, the matter was taken into the hands of the government in the above-named year, and is now managed by the adjutant-general. Formerly, a soldier enlisted for life, and could never look forward to a period of freedom; or, at best, he could not retire on a pension while still possessed of a fair share of health and strength. This system was changed in 1847, by an act relating to *limited* enlistment. If a man serves as a soldier in an infantry regiment for ten years, he is then at liberty to leave the army; but if he wishes to retire on a small pension, he must serve a further period of eleven years, making twenty-one years' service in all. He has a choice, and, if he please, six months for deliberation, whether he will render this second period of service or not. In the cavalry and artillery, the two terms of service are of twelve years respectively. If apprentices enlist, the master may recover them under certain conditions detailed in the Mutiny Act (q. v.) (which is passed every year); and if they state to the magistrate that they are not apprentices, they may be punished for fraud, and are liable to serve in the army on the expiration of their indentures. If the master consent to the enlistment, he is entitled to part of the bounty. The Mutiny Act also provides that servants enlisting before the term of their engagement, are validly enlisted, and are entitled to wages up to the date of enlistment. Periods of imprisonment are not reckoned as part of the time of limited enlistment. A recruit enlists into some particular regiment, at his own choice, not into the general army; but artificers, as armourers, &c., are usually enlisted for general service, so that their services may be made available where most required. Every recruit is asked whether he belongs to the militia, and whether he enlists willingly. He has to appear before a magistrate, and make declaration that the enlistment is voluntary on his part. Several other questions are put to him; some of the Articles of War are read to him; and he is expected to understand his real position before the oath is administered. This is intended to obviate the gross abuses of the old system, under which recruits were sometimes irrevocably enlisted when drunk and almost insensible. The oath is signed by the magistrate, the recruit, and a witness, and a certificate is given to the newly made soldier. If, at this interview with the magistrate, the young man repents of his previous engagement with the recruiting-officer, he may buy himself off by paying twenty shillings as Smart-money (q. v.), and defraying any other expense he may have occasioned. He cannot retract without paying this fine; a simple refusal to take the oath is followed by imprisonment. The Mutiny Act specifies many other cases in which the recruit renders himself liable to imprisonment.

At the commencement of the war with Russia, or rather in 1855, an act empowered the crown to enlist soldiers for a shorter period than ten years, on emergency; but the exercise of this power is placed under certain parliamentary limitations. In the Royal Marines, the enlistment is usually for twelve years.

ENLISTMENT, in the Navy, is managed by the Admiralty, and is changed from time to time in its details, according to the degree of willingness among seafaring men to enter the service. In 1830, an act was passed to give certain additional advantages to volunteer seamen. In 1835, another act empowered the crown to double the amount of bounty given to a volunteer, if he was already a seaman. In 1847, it was enacted that such persons as were entitled, if enlisted, to double bounty, should form a select class; and that shipowners should not be allowed to hire such persons as crews for merchant-ships, if the government thought proper to issue a proclamation to that effect. At the commencement of the war with Russia, in 1854, it was deemed expedient not only to give extra bounties to seamen willing to enlist, but to make a money-present to seamen already in the navy, as an equivalent advantage. The bounty given to seamen varies from time to time, according to the exigencies of the service; but recent legislation has established a distinction between *limited* and *continuous* service. A seaman may enlist for five or for ten years, or for the period the ship he enters is in commission; if for the longer period, he receives higher pay and other advantages. At the end of this longer period, he may demand his discharge; and, if abroad, he may claim to be brought home free of expense. His commanding-officer may, in emergency, retain his further service for six months, on payment of another increase of pay. The crown, besides, possesses a power of compelling renewed service from seamen under certain conditions, in case of invasion or other national peril.

Other matters bearing on this subject will be found noticed under BOUNTY, COAST VOLUNTEERS, IMPRESSMENT, and MANNING THE NAVY.

ENMANCHÉ, or **EMANCHÉ**. See MANCHE.

ENNEMOSER, JOSEPH, known as a medico-philosophic writer, was born 15th November 1787, at Hintersee, in the Tyrol, and commenced his academic studies at Innsbruck in 1806. On the rising of the Tyrolese against the French in 1809, E. followed Andreas Hofer as his secretary, and honourably distinguished himself in battle on several occasions. At the close of the war, he went to Erlangen, and subsequently to Vienna, for the purpose of concluding his studies. Here, however, he experienced the greatest difficulty in procuring the means of subsistence, but fortunately fell in with a merchant from Altona, in whose company he travelled for some time. When Napoleon declared war against Russia in 1812, E. was despatched to England, to solicit aid for the Tyrolese in their meditated insurrection against the French domination. He was afterwards appointed by Friedrich Wilhelm III., king of Prussia, an officer in a regiment of volunteers, and soon gathered about him a company of Tyrolese marksmen, who were of great service during the campaigns of 1813 and 1814. After the peace of Paris, E. went to Berlin, where he finished his curriculum, and in 1816 took his degree of Doctor of Medicine. In 1819, he was made Professor of Medicine at the new university of Bonn, where he lectured on Anthropology, Physical Therapeutics, and Pathology. A love of his native country induced him to settle as a physician in Innsbruck, but in 1841 he went to Munich, where he has obtained a great reputation by the application of magnetism as a curative power. Among his writings may be mentioned, *Der Magnetismus in seiner geschichtlichen Entwickelung* (Leip. 1819), which is reckoned his principal work; *Historisch-psychologische Untersuchungen über den Ursprung und das Wesen der Menschlichen Seele* (Bonn, 1824); *Anthropologische Ansichten zur bessern Kenntnisz des Menschen* (Bonn, 1828); *Der Magnetismus im Verhältnisz zur Natur und Religion* (Stuttg. 1842); *Der Geist des Menschen in der Natur* (Stuttg. 1849); *Was ist die Cholera* (2d edit., Stuttg. 1850); and *Anleitung zur Mesmer'schen Praxis* (Stuttg. 1852).

E'NNIS, a parliamentary and municipal borough, in the middle of Clare county, Ireland, the capital of the county, on the Fergus, 20 miles west-north-west of Limerick. It is a neat-looking town, with some good houses. Pop. (1861) 6993. It returns one member to parliament. It has the ruins of a monastery founded in 1240 by O'Brien, Prince of Thomond. Near the town is Ennis College, one of the four classical schools founded by Erasmus Smith. E. has a valuable limestone quarry, large flour-mills, and some trade in grain and cattle.

ENNISCO'RTHY, a market-town in the middle of Wexford county, Ireland, on a steep rising ground on the Slaney, 14 miles north-north-west of Wexford. The Slaney is here tidal and navigable for barges, and flows through a very rich, fertile, and beautiful valley. Pop. (1861) 5369. E. is a rising town, and has a large corn-trade. It arose in a Norman castle, still entire, founded by Raymond le Gros, one of the early Anglo-Norman invaders. Cromwell took E. in 1649; and the Irish rebels, stormed and burned it in 1798.

ENNISKI'LLEN, a parliamentary and municipal borough in the middle of Fermanagh county, Ireland, the chief town of the county, about 75 miles west-south-west of Belfast. It is beautifully situated on the Erne; the greater portion of it, however, is on an isle in the river between the Upper and Lower Loughs Erne. It consists mainly of one undulating street running east and west. Around, are richly cultivated eminences and many fine mansions. Its two forts command the only pass for 50 miles into Ulster across the Erne. The chief manufactures are cutlery and straw-plait. Pop. (1861) 5655. It returns one member to parliament. E. is famous for the victory, in 1689, won by the troops of William III., under Lord Hamilton, over a superior force of James II., under Lord Gilmoy. The banners taken in the battle of the Boyne hang in the town-hall of Enniskillen. The regiment of Enniskilleners or 6th Dragoons, was first instituted from the brave defenders of the town.

E'NNIUS, one of the earliest Roman poets, the father of the Roman Epos, was born at Rudiæ, in Calabria, about 240 years before the Christian era, and was probably of Greek extraction. He is said to have served in the wars, and to have risen to the rank of a centurion. In Sardinia, he became acquainted with Cato the Elder, and returned with him to Rome when about the age of 38. Here he gained for himself the friendship of the most eminent men, among others that of Scipio Africanus the Elder, and attained (what was then exceedingly rare in the case of an alien) to the rank of a Roman citizen. He supported himself in a decent but humble manner by instructing some young Romans of distinguished families in the Greek language and literature, his accurate knowledge of which explains the influence he had on the development of the Latin tongue. He died when he had attained the age of 70, or about 190 B.C. His remains were interred in the tomb of the Scipios, and his bust was placed among those of that great family. E. has tried his powers in almost every species of poetry, and although his language and versification are rough and unpolished, these defects are fully compensated by the energy of his expressions, and the fire of his poetry. His poems were highly esteemed by Cicero, Horace, and Virgil: the last, indeed, frequently introduces whole lines from the poetry of E. into his own compositions. His memory seems to have been lovingly cherished by his countrymen; *Noster Ennius*, 'Our Ennius,' they used to call him. Of his tragedies, comedies, satires, and particularly of his *Annales*, an epos in 18 books, only fragments are still extant. What adds to our regret is, that it is believed his whole works were extant as late as the 13th c. (A. G. Cramer, *Hauschronick*). The fragments have been collected and edited by various scholars, among others by Hessel (Amst. 1707). The fragments of the *Annales* have been edited by Spangenberg (Leip. 1825). Compare Hoch, *De Ennianorum Annalium Fragmentis* (Bonn, 1839). The few fragments of his dramas that have come down to us were collected by Bothe in the *Poetarum Latii Scenicorum Fragmenta* (5 vols.).

ENNS, a river of Austria, rises at the northern base of a branch of the Noric Alps in the crown-land of Salzburg, 12 miles south of Radstadt. It first flows north to Radstadt, then north-north-east to Hieflau, after which it proceeds in a general direction north-north-west, passes Steyer, and joins the Danube 11 miles below the town of Linz, after a course of about 120 miles. Its chief affluents are the Salza and the Steyer. For the last 15 miles of its course, the E. forms the boundary between Upper Austria (Ober der Enns) and Lower Austria (Unter der Enns). The scenery on the banks of the E. is in general bold and romantic, as it flows, for the most part, between parallel mountain-chains, which are lofty and precipitous. In its lower course, it becomes navigable, but it is chiefly important from the valuable water-power which it supplies.

E'NOCH, the name of two different individuals in Scripture.—1. The eldest son of Cain, who built a city which was called after his name.—2. The son of Jared, and father of Methuselah. A peculiarly mysterious interest attaches to him on account of the supernatural manner in which his earthly career terminated. We are told by the writer of Genesis, that E. 'walked with God 300 years . . . and he was not; for God took him.' What the statement 'he was not' signified to the later Jews, is explained by the writer of the Epistle to the Hebrews: 'Enoch was translated that he should not see death.' E. and Elijah are the only human beings on record who did not require to discharge the debt which mortals owe to nature. It may naturally be supposed that E. was a character on whom the extravagant fancy of the later Jews would fasten with unusual pleasure. As they came more and more into contact with Grecian and other culture, they felt the necessity of linking on the arts and sciences of Gentile nations to their own history, if they would continue to preserve that feeling of supremacy which was so dear to their pride as the chosen people. Hence, E. appears as the inventor of writing, arithmetic, astronomy, &c., and is affirmed to have filled 300 books with the revelations which he received, the number 300 being obviously suggested by the number of years during which he is said to have walked with God.

ENOCH, Book of. This book, from which, curiously enough, St Jude quotes as if it were history, shews how richly mythical the history of the mysterious antediluvian Enoch had become! It was probably written originally in Aramaic, by a native of Palestine, in the 2d c. B.C. The precise date is not known. At subsequent periods, it would seem to have been enlarged by additions and interpolations. It is divided into five parts; and the *first* discourses of such subjects as the fall of the angels, and the journey of E. through the earth and through Paradise in the company of an angel, by whom he is initiated into the secrets of nature, &c.; the *second* contains E.'s account of what was revealed to him concerning the heavenly or spiritual region; the *third* treats of astronony and the phenomena of the seasons; the *fourth* represents E. beholding, in prophetic vision, the course of Divine Providence till the coming of the Messiah; and the *last* consists of exhortations based on what has preceded. The book was current in the primitive church, and was quoted by the Fathers, but was lost sight of by Christian writers about the close of the 8th century, so that until last century it was only known by extracts. Fortunately, however, the traveller Bruce discovered in Abyssinia three complete MSS. of the work, which he brought to England in 1773. These MSS. proved to be an Ethiopic version made from the Greek one, in use among the Fathers, as was evident from the coincidence of language. The Ethiopic version did not appear till 1838, when it was published by Archbishop Lawrence. An English translation, however, by the same writer, had appeared in 1821, which passed through three editions, and formed the basis of the German edition of Hoffmann (Jena, 1833—1838). In 1840, Gfrörer published a Latin translation of the work; but by far the best edition is that of Dr A. Dillmann, who, in 1851, published the Ethiopic text from five MSS.; and in 1853, a German translation, with an introduction and commentary, which has recently turned the attention of many German scholars to the subject.

E'NOS (anciently, *Ænos*), an ancient town and seaport of European Turkey, in the province of Rumili, is situated on a rocky isthmus at the mouth of a gulf of the same name, about 35 miles west-north-west of Gallipoli. It is the port of Adrianople, and has some trade in wool, camels' hair, cotton, leather, silk, &c. Its harbour is commodious, but so shallow, from being choked up with sand, that it admits only small vessels. Pop. 6000, principally Greeks. The Gulf of Enos is about 2½ miles wide at the entrance, extends into the country for about 14 miles, and is on an average 5 miles broad.

The town of E. is very ancient. Virgil mentions it (*Æn.* iii. 18) as being one of the towns founded by Æneas, after the sack of Troy; and Homer also attests its antiquity by alluding to it in his great poem (*Il.* iv. 519).

ENRIQUEZ, GOMEZ ANTONIO (properly, ENRIQUEZ DE PAZ), a Spanish poet, the son of a baptized Portuguese Jew, was born at Segovia early in the 17th century. He entered the army in his 20th year, and rose to the rank of captain; but in 1636, had to flee the country, to escape the persecution of the Inquisition, which suspected him of a secret leaning to the creed of his father. E. settled at Amsterdam, and latterly professed the Jewish faith; in consequence of which, he was burned in effigy by the pious Catholics of Seville, 14th April 1660. The date of his death is not known. During his residence in Spain, E. had considerable reputation as a dramatic poet. According to his own account, he wrote 22 comedies, which met with great success on the stage, in consequence of which, several of them passed as Calderon's. *La prudente Abigaïl*, *Engañar para reinar*, *Celos no ofenden al sol*, and *A lo que obligan los celos*, were published under the name of Fernando de Zárate. E's. comedies shew him to have possessed much inventiveness, but in other respects they deserve little praise. Among his other writings are *Las Academias morales* (Rouen, 1642), containing some fine elegiac verse; *La Culpa del primer peregrino* (Rouen, 1644), a mystico-theologic poem; *El siglo Pitagórico* (Rouen, 1647), a series of satirical portraits partly in prose and partly in verse; and *El Samson Nazareno* (Rouen, 1656), an abortive epic. For a notice of E. and his writings, see *Estudios historicos politicos y literarios sobere los Judios de España*, by José Amador de los Rios (Madrid, 1848).

ENRO'LMENT, entry upon a register or record.

Enrolment of Deeds.—In order to prevent the secret transfer of lands which was effected in England by means of a Bargain and Sale (q. v.), it was provided by 27 Hen. VIII. c. 16, that no transfer of land should be effected by bargain and sale, unless the deed were enrolled within six months of the date of the deed. By the Fines and Recoveries Act (3 and 4 Will. IV. c. 74), it is enacted that all transfers of land effected under the provisions of that statute, must be enrolled in the Court of Chancery within six months after the execution.

Enrolment of Decree in Chancery.—A decree in a suit in Chancery does not receive full effect until it has been enrolled. A cause may be re-heard by the judge before whom it has been argued, or may be taken to the court of appeal until enrolled; but after enrolment the cause can only be heard in the House of Lords. If not enrolled within six months, an order for enrolment is necessary. The opposite party wishing to prevent an enrolment, must lodge a caveat, if he has not presented a petition for re-hearing.

ENSEMBLE (Fr.), the general effect produced by the whole figures or objects in a picture, the persons and plot of a drama, or the various parts of a musical performance.

E'NSIGN is the title of the lowest combatant rank of commissioned officers in the British army, and is derived from their being charged with the duty of carrying the regimental colours or ensign (Fr. *enseigne*, Lat. *insigne*). In the hand-to-hand mêlées of the middle ages, the preservation of the colours or standard, as the rallying-point of those fighting under the same leader, was a matter of vital importance, and was only intrusted to the bravest and most trustworthy. The colours were committed to him with imposing ceremony in presence of the assembled regiment, and he had to take an oath to defend them with life and limb, and if need were, to wrap himself in them as a shroud, and devote himself to death. The man who undertook this perilous post received sometimes as much as sixfold the usual pay. It was doubtless in this way that the point of honour arose respecting the colours. History records repeated instances where the oath was kept to the letter. In the modern system of warfare, the regimental colours are seldom exposed to such danger, and the office of ensign is of less account. In the infantry, there are two kinds of subalterns below the captain, viz., the lieutenant and the ensign. In the cavalry and artillery, the duties of ensign are taken by officers who receive the titles of cornet or lieutenant. When a gentleman enters the army, he always begins as an ensign (if in the infantry), and from this rank he rises by purchase or seniority. The price of an ensign's commission is stated under COMMISSIONS, ARMY, as well as the extra price to be paid on rising to the rank of lieutenant. The pay is 5*s.* 3*d.* per day, and the half-pay 1*s.* 10*d.* to 3*s.*; although it is most unusual for an ensign to be on half-pay. An ensign in the Foot Guards ranks as a lieutenant in the army, and, on transferring his services to an infantry or cavalry regiment, would exchange with an officer of that grade.

The ensign's duty generally is to assist the captain in reference to everything belonging to the particular company which the latter commands. There are as many ensigns in an infantry regiment as there are companies; and one of these has the duty of carrying the regimental colours when on the march or on parade.

In the late East India Company's army, a cadet became an ensign, in rank and pay, directly he landed in India.

ENSIGN is also the name of one of the flags belonging to the British fleet; and, under that or some other name, to most other fleets. It is a large flag or banner hoisted on an ensign staff, a long pole erected over the poop, or at the gaff when the ship is under sail. Its chief purpose is to denote the nation to which the ship belongs. The English ensign has for a groundwork one of three colours—red, white, or blue (the use of one of these colours indicates a particular squadron of the English navy)—and bears the Union double cross of St George and St Andrew, or Union-Jack (q. v.), in the upper corner next the mast (dexter-chief). The *white* ensign is also divided into four quarters by a red cross of St George. The ensign is of the same colour as the pennant. Merchant-vessels are only allowed to carry the *red* ensign; but yachts, if of clubs acknowledged by the Admiralty, are permitted to use the three colours. Formerly, the English admirals required ships of all other nations to dip their ensigns as a token of respect to the English flag: the refusal of the Dutch to comply with this custom, was the signal for one of Blake's bloodiest encounters with Van Tromp.

ENTA'BLATURE, that part of a design in classic architecture which surmounts the Columns (q. v.), and rests upon the capitals. It is usually about two diameters of the column in height, and is divided in every style of classical architecture into three parts—architrave, frieze, and cornice. These parts vary in their relative proportions in different styles. In Doric architecture, for example, if the entablature be divided into eight equal parts, two of these form the height of the architrave, three that of the frieze, and three that of the cornice. In the other styles, the relative proportions are as three, three, and four.

The term entablature was not used till the 17th c., the members composing it being previously simply designated the cornice, frieze, and architrave.

1. *The Architrave* is the horizontal portion which rests immediately upon the abacus of the column. It is usually ornamented with horizontal mouldings, with flat spaces or *faciæ* between. The upper moulding always projects further than the others, so as to throw off the rain. This moulding varies in different styles. In Doric (fig. 1), it is a plain square projection, with small pendants or *guttæ* under the triglyphs. In the other styles, it is generally an ogee or talon moulding. These mouldings are frequently enriched with leaf ornaments, and in very florid designs the faciæ are also enriched.

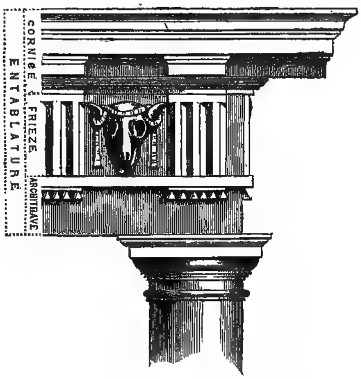


Fig 1.—Example of Doric Entablature.

2. *The Frieze* is the middle portion of the entablature, between the top of the architrave and the bed of the cornice. In the Doric style, it is ornamented with triglyphs or slight projections, divided by angular grooves into three parts. The spaces between the triglyphs (called metopes) are square, and are either plain or enriched, either with figure-sculpture, as in the Parthenon, or with bulls' heads, pateræ, or other ornaments. In the other styles, the frieze is never cut into portions, but is either left quite plain or ornamented with figure-sculpture or scroll-work. The former is most usual in Greek art, the latter in Roman. In late Roman works, the frieze is sometimes *swelled* or made to project with a curve.

3. *The Cornice* forms the upper portion of the entablature. It is divided into several parts. The lower moulding or mouldings resting on the frieze are called the bed-mouldings—the upper projecting part is called the Corona (q. v.), and between the two there are frequently introduced modillions and dentil bands. The bed-moulding is generally of an oval or echinus form, and is frequently enriched with the egg and tongue or leaf ornaments. The upper moulding of the corona is generally of a *cymarecta* form (see COLUMN, fig. 1), and is often ornamented with lions' heads. These represent the openings through which the rain was at first led off from the roof-gutters, which were cut in the top of this moulding, and were retained as ornaments after their original use was discontinued. The corona projects well over the frieze and architrave, and protects them from rain, while at the same time, by its broad shadow, it gives repose and variety of effect to the building. The *soffit*, or under side of the corona, is frequently panelled and ornamented with pateræ.

Origin.—The component parts of the entablature are said, with some appearance of truth, to owe their origin to the forms of the construction of the oldest temples. These were of wood, and were put together in the manner most natural for that material. The square beams laid across from post to post are represented by the architrave; the triglyphs of the frieze are copied from the ends of the cross-beams; the cornice is taken from the boarding which covered the rafters and ties of the roof—projected so as to throw off the rain; and the dentils and modillions shew the ends of the rafters left uncovered.

Whatever the origin of the entablature may have been, it is a remarkable fact, as connected with Greek and Roman art, how persistent the entablature was as a feature in the decoration of these classic styles. So long as buildings consisted of one story in height, this was quite natural; but after this simple system was abandoned, and when, as in Roman architecture, series of columns and entablatures were piled one above the other—not used constructionally, but simply applied to the face of the building—the cornice, frieze, and architrave still retained their places and proportions. In the revived Roman art of the 16th c., the entablature was used in a manner still further removed from its original purpose (fig. 2). The strict proportions of the various parts were entirely lost sight of. The frieze was increased in height, so as to admit of small windows, to light the entresol or Mezzanin (q. v.), and in the French and English forms of the renaissance, the various members become still more attenuated and altered from the original design (see RENAISSANCE). But in no modification of classic architecture, however debased, is the entablature awanting. The architrave, frieze, and cornice are essential portions of every classic design.

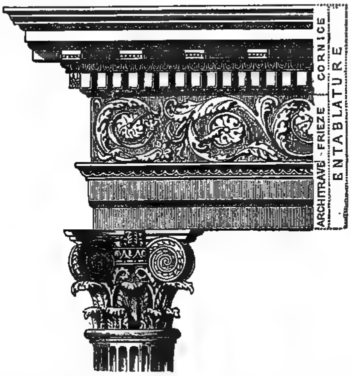


Fig. 2.—Example of Composite Entablature.

ENTADA, a genus of climbing shrubs of the natural order *Leguminosæ*, suborder *Mimoseæ*, having pinnate or bipinnate leaves, and remarkable for their great pods, in which the seeds lie amidst a glutinous or gelatinous substance. The seeds of *E. Pursætha*, an East Indian species, are saponaceous, and are used for washing the hair. The plant attains a great size: its pods are sometimes fully five feet long, and six inches broad; the seeds are beautiful brown beans, so large that in Ceylon they are often hollowed out and used as tinder-boxes.

ENTAI'L, or **ENTAY'LE** (Fr. *tailler*, to cut), often used by old English authors for any architectural ornament which is sculptured or cut in stone. Chaucer speaks of

> 'An image of an other entaile;'

and other examples are given by Parker (*Glossary of Architecture*).

ENTAIL, or, as it is frequently called in Scotland, *tailzie*, from Fr. *tailler*, to cut, properly signifies any destination by which the legal course of succession is cut off, one or more of the heirs-at-law being excluded or postponed, and the settlement of land made upon a particular heir or series of heirs. The desire to preserve in our own family land which we have either inherited or acquired, appears to be inherent in the human mind. The first distinct trace of the existence of entails, is to be found in the Roman law. The Greeks, indeed, permitted persons to name successors to their estates, and to appoint a substitute who should take the estate on the failure of him first named. The substitute, as appointed, was permitted to succeed on the death of the institute (as he was called) without leaving issue or without alienating the estate. But this limited right fell far short of the power of entailing which has since prevailed in various countries. At Rome, under the later emperors, the practice of settling land upon a series of heirs, by means of *Fideicommissa* (q. v.), grew up, and was sanctioned by the state. These deeds, which were originally simply a trust reposed in the honour of a friend, to whom the property was conveyed, to carry out the will of the grantor, by degrees received the sanction of the law. In their early form, they contained merely a substitution of heirs. Thus, '*Rogo ne testamentum faciat, donec liberos susceperit.*' '*Rogo ut testamento suo Seium hæredem faciat.*' '*Rogo hæredem, ne hæreditatem alienet, sed relinquat familiæ.*'—Heineccius, s. 658. But by the later law, a much fuller form of settlement was admitted, whereby the estate was protected from every sort of alienation. '*Volo meas ædes non vendi ab hæredibus meis, neque fænerari super eas: sed manere eas firmas, simplices, filiis meis et nepotibus in universum tempus. Si aliquis autem eorum voluerit vendere partem suam, vel fænerari super eam, potestatem habeat vendere coheredi suo et fænerari ab eo: si autem aliquis prœter haec fecerit, erit quod obligatur, inutile atque irritum.*'—*Dig.* xxxi. 88, s. 15. Here we have an example of the principal clauses of a strict entail as subsequently more fully carried out in Scotland. It is impossible to doubt that this Roman form must have been adopted by the Scottish lawyers in framing their deeds of entail. The limitation to a particular line of descent, the prohibition to alienate or burden with debt, and the still more peculiar feature of the declaration of forfeiture in case of non-compliance, are to be found in both forms. There are, however, two points in which the Roman law differed from that which prevailed for many years in Scotland—viz., that the former did not recognise the right of primogeniture, and that the limitation of the deed was restricted to four generations. For the right of primogeniture, as recognised in deeds of entail, we are indebted to the feudal law. That system, which has united with the civil law to form a basis for the codes of modern Europe, did not, in its original form, recognise the right of a holder of land to alienate his feudal benefice. But the right of the eldest son to represent his father, both in the duties and privileges of the fief, if not an original principle of the system, was universally recognised in the days of its greatest power. We shall presently see how this principle was embodied in a Scottish deed of entail. We come now to consider entails as they have existed in modern nations.

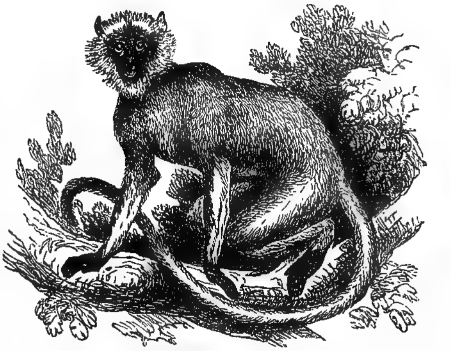
In England, the Saxons, it is said, prohibited the alienation of lands by those who had succeeded to them under condition that they should not alienate.—Wilkins's *Leges Saxonicæ*, p. 43 (note). Among the Saxons, the law of primogeniture was not recognised. But on the establishment of the feudal laws in England, a practice began to prevail whereby an estate was settled upon a particular series of heirs, as 'to a man and the heirs of his body.' This is the first germ of an entail in England. It was called a fee-simple conditional, because the judges refused to recognise an absolute limitation of the estate to a particular line of heirs, but held the destination to be conditional on the birth of an heir, and that that condition having been purified, the donee was free to alienate the estate. The common law thus refusing to recognise entails, a statute was passed which had the effect of introducing that practice into England. This was the famous statute *De Donis* (q. v.), whereby it was declared that the estate should be held *secundum formam doni.* In order to the creation of an entail under this statute, it was not enough that the estate was limited to 'a man and his heirs,' as those words were held to constitute an estate in fee; it was necessary that the estate should be given to 'a man and the heirs of his body,' or 'to a man and the heirs of his body by his wife Joan.' The former was called a general, the latter a special entail. Another form whereby lands might be entailed under the statute *De Donis*, was by settlement in Frankmarriage (q. v.). For nearly 200 years after the passing of this act, lands settled in the form which it prescribed continued to be held under the fetters of a strict entail. But the tendency of the law, which in Scotland, as we shall presently see, was to strengthen the power of entails, was, in England, in the opposite direction. For a long time, tenants in tail, taking advantage of legal technicalities, were able practically to defeat the limitation in tail by means of a Discontinuance. But it was not till the time of Edward IV. that an effectual means of evading the provisions of the act was brought into use; this was achieved by means of a process called a common recovery. See Fines and Recoveries. By this process, a tenant in tail could bar the entail, and convert the estate into a fee-simple. Another mode of barring an entail was by means of a Fine (q. v.). It had been declared by the statute *De Donis*, that levying a fine of lands should be no bar to the entail; but by 32 Hen. VIII. c. 36, it was enacted that a fine of lands, when duly levied, should be a complete bar to the tenant in tail, and those claiming under him. It is to be observed that the operation of a fine was confined to those claiming under the tenant in tail; those who had rights of reversion or remainder under the grantor of the entail were not excluded by this species of assurance; so that by means of a recovery only could an estate tail be converted into a fee-simple. From the introduction of common recoveries till the passing of the Fines and Recoveries Act (3 and 4 Will. IV. c. 74), a period of more than 300 years, it was impossible that an estate could be held under the fetters of an entail, if the tenant in tail and the next heir chose to combine to defeat the entail. By the Fines and Recoveries Act, the technicalities formerly necessary in order to bar an entail were removed, and tenant in tail may now, by a simple conveyance, alienate his estate at pleasure. An estate tail is a freehold of a limited description. Tenant in tail may commit Waste (q. v.). Formerly, an estate tail was not liable to the debts of the tenant, but by 1 and 2 Vict. c. 110, this restriction has been removed. Copyhold lands have been held not to fall under the operation of the statute *De Donis.* A limitation, therefore, which in a freehold creates an estate tail, in copyhold lands creates a fee-simple conditional, according to the old common law, except where the custom of the manor is to the contrary.

In Scotland, as in England, entails appear first to have taken their rise from the feudal usages. It has been observed by Lord Kames, that while the feudal system was in its vigour, every estate was in fact entailed, because no proprietor had any power to alter the order of the succession. But when the stricter feudal principles gave way, and the power of alienating land began to be recognised, the holders of estates sought to secure, by deed, in their own families the lands which they possessed. The form first adopted for this purpose was the simple destination, whereby the estate was simply limited to a particular series of heirs, without prohibition to alienate, or declaration of forfeiture for contravention of the will of the grantor. In this form, the deed must have resembled the early English entails. The feudal law of primogeniture having been received as a principle of common law, the estate would naturally descend from father to son in the line indicated by the deed. But, as it was held that those succeeding under this deed were not restrained from alienating, the practice of adding prohibitory clauses was introduced. Entails in this form were held to bind the heir from granting gratuitous alienations; but he was not restrained from selling the estate, or burdening it with debt. Early in the 17th c., a further addition was made to the form of the deed by the introduction of irritant and resolutive clauses, i. e., clauses declaring the act of alienation to be null, and to infer the forfeiture of the estate. The form thus adopted, which resembles closely the form of the Roman deed already noticed, was fortified by a decision of the Court of Session in the Stormont entail, M. 13994, holding that an estate so protected could not be attached by creditors. This decision created much difference of opinion amongst lawyers as to the power of the grantor thus to protect an estate from the onerous act of the heir, in consequence of which the famous Scotch Entail Act, 1685, c. 22, was passed, by which it was enacted that an estate conveyed by a deed fortified by prohibitory, irritant, and resolutive clauses, and recorded in a particular register, should be effectually secured in the line of destination. This act has always been most strictly viewed by Scottish lawyers; and entails which have been found deficient in any of the prescribed requisites, have been regarded by the courts as utterly ineffectual. The first Lord Meadowbank, in a judgment which has always been regarded as a leading authority, laid it down that entails 'are the mere creatures of statute,' and that where the interests of third parties are concerned, every part of an entail is liable to the strictest interpretation (*Hamilton* v. *Macdowall*, 3d March 1815). The operation of the old entail act was found, notwithstanding, to be of the most oppressive character. Statutes were in consequence passed from time to time, empowering heirs of entail to grant leases of their lands of longer duration than could be granted under the act 1685, and to make provisions for their families. But at length, by the 11th and 12th Vict. c. 36, the power of fettering lands by a strict entail has been finally destroyed. By this act, heirs under an existing entail may disentail, with the consent of certain heirs next in succession; and in all entails made after 1st August 1848, and also in old entails where the heir in possession was born since 1st August 1848, the heir of entail in possession may, by means of a simple deed of disentail, free his estate from the restrictions of the entail.

In America, before the rebellion, the English law as to estates tail prevailed. But in the United States, the law of entails has been gradually abandoned by the several states; and property can now be fettered, to a limited extent only, by means of executory Devises (q. v.). In France, the power of creating entails has varied much at different periods, from the right to make a perpetual entail, which appears to have been the original principle, to a limitation to four, and at one time to two degrees. But by the Code Napoleon, ss. 896—897, entails are now absolutely prohibited. In Spain, also, entails, which were permitted under certain restrictions, have been entirely abolished by a law of the Cortes in 1820. Thus it will be seen that the right of securing land in a particular family, which commends itself to the natural feelings, has been found so oppressive in operation, and so injurious to the public interest, that after an existence of more than 600 years it has been practically discarded almost simultaneously by the general consent of modern nations.

E'NTASIS (Gr.), the swelling outline given to the shaft of a Column (q. v.).

ENTELLUS MONKEY, or **HONUMAN** (*Semnopithecus Entellus*), an East Indian species of monkey, with yellowish fur, face of violet tinge, surrounded with projecting hairs, long limbs, and very long muscular and powerful—though not prehensile—tail. It is held in superstitious reverence by the Hindus, and is often to be seen exhibiting much impudent familiarity in the precincts of temples; indeed, temples are often specially dedicated to it; hospitals are erected for its reception when sick or wounded. Hindu laws affix a far more severe punishment to the slaughter of one of these sacred monkeys than of a man; the peasant esteems it an honour when his garden is plundered or his house robbed by troops of them, and would consider it an act of the greatest sacrilege to drive them away. They take their places with perfect confidence on the roofs of houses, and gaze at the passing crowd. This is one of the very few species



Entellus Monkey (*Semnopithecus Entellus*).

of monkeys found in the northern provinces of India, and in summer ascends the Himalaya to the pine-forests, and almost to the snow-line; it has even succeeded in crossing the mountains, and occurs in Bhotan.

ENTERI'TIS (Gr. *enteron*, the intestines), inflammation of the bowels, and especially of their muscular and serous coat, leading to Constipation (q. v.) and pain, with Colic (q. v.), and sometimes Ileus (q. v.). Enteritis is distinguished from these last affections, indeed, only by the presence of inflammatory symptoms—i. e., pain, tenderness, fever, &c., from a very early stage of the disease, and in so decided a form as to require special attention. If enteritis does not depend upon mechanical obstruction, it may be combated by hot fomentations, with moderate leeching and counter-irritation, and the internal administration of opium. Injections of warm water, or of asafœtida and turpentine (see CLYSTER), should be at the same time given to clear the lower bowel; and all purgatives, except in some cases castor oil, should be avoided. The disease is, however, one of great danger, and should never be incautiously treated with domestic remedies. It is closely allied to Peritonitis (q. v.), and often depends upon internal mechanical causes, or on external injury.

In the Lower Animals.—Inflammation of the bowels, among the heavier breeds of horses, generally results from some error of diet, such as a long fast followed by a large, hastily devoured meal, indigestible or easily fermentable food, or large draughts of water at improper times. When thus produced, it is frequently preceded by stomach staggers or colic, affects chiefly the mucous coat of the large intestines, and often runs its course in from eight to twelve hours. With increasing fever and restlessness, the pulse soon rises to 70 or upwards, and, unlike what obtains in colic, continues throughout considerably above the natural standard of 40 beats per minute. The pain is great, but the animal, instead of recklessly throwing himself about, as in colic, gets up and lies down cautiously. Respiration is quickened, the bowels torpid. Cold sweats, stupor, and occasionally delirium, precede death. When connected with, or occurring as a sequel to influenza, laminitis, and other complaints, the small intestines are as much affected as the large, and the peritoneal as well as the mucous coat of the bowels. This form is more common in the lighter breeds. When the patient is seen early, whilst the pulse is still clear and distinct, and not above 60, and the legs and ears warm, bloodletting is useful, as it relieves the overloaded vessels, and prevents that exudation of blood which speedily becomes poured out in the interior of the bowels. This disease should be treated as follows: In a pint of oil, or an infusion of two drachms of aloes in hot water, give a scruple of calomel and an ounce of laudanum, and repeat the calomel and laudanum every hour in gruel until the bowels are opened, or five or six doses are given. Encourage the action of the bowels by using every half hour soap and water clysters, to which add laudanum so long as pain and straining continue. If the animal is nauseated and stupid, with a cold skin, and a weak quick pulse, bleeding and reducing remedies are very injurious; and the only hope lies in following up one dose of the calomel and aloes with small doses of laudanum and sweet spirit of nitre, or other stimulants, repeated every forty minutes. In all stages, woollen cloths wrung out of hot water and applied to the belly encourage the action of the bowels, and relieve the pain.

Enteritis in cattle is mostly produced by coarse wet pasture, acrid or poisonous plants, bad water, and overdriving. The symptoms are fever and thirst, a quick but rather weak pulse, restless twitching up of the hind limbs, tenderness of the belly, and torpidity of the bowels. Calves generally die in three or four days, other cattle in a week or nine days. Bleed early, open the bowels with a pint of oil and a drachm of calomel, which may be repeated in eight or ten hours, if no effect is produced. Give every hour fifteen drops of Fleming's tincture of aconite in water, until six or seven doses are given. Allow only sloppy and laxative food, such as treacle, gruel, or a thin bran mash; employ clysters and hot cloths to the belly, and use two-ounce doses of laudanum if the pain is great. Enteritis in sheep mostly occurs in cold exposed localities, and where flocks are subjected to great privations or improper feeding. The symptoms and treatment resemble those of cattle.

ENTOMO'LOGY (Gr. *entomon*, an insect, *logos*, a discourse), the science which has INSECTS (q. v.) for its subject. The mere collector of insects may be one of the humblest labourers in the great field of natural history, but his labours contribute materials for the more philosophic naturalist who studies the structures of these creatures, and compares them with one another according to the unity and the variety of design which they exhibit. And when we begin to take into account the vast number of different species of insects, their great diversities of structure and of habits, their great complexity of organisation, the wonderful transformations which many of them undergo at different stages of their existence, and the equally wonderful but extremely various instincts which many of them display, we find entomology to be a science worthy to engage the noblest mind. But besides all these things, we must remember that insects serve most important purposes in the general economy of nature; and that some of them are directly useful to man, some directly injurious, at least when their numbers are at any time excessively multiplied.

Entomology, along with the other branches of natural history, was cultivated by Aristotle and other Greeks. Aristotle is the most ancient author of whose works anything relating to this science now remains. Pliny has little on this subject but what is copied from Aristotle; and it can scarcely be said to have been again studied as a science till the 16th c., when attention began once more to be directed to it, although it was not till the 17th c. that much progress was made, or that any important works on entomology appeared. Insects then began to be described, not only those of Europe, but also some of the curious and splendid insects of tropical countries; bees and other insects of particular interest received attention; the metamorphoses of insects began to be studied, and their anatomy to be investigated. The names of Goedart, Malpighi, Swammerdam, Leuwenhoek, and Ray deserve to be particularly mentioned; but the infant state of the science may be illustrated by the fact, that about the end of the 17th c., Ray estimated the whole number of insects in the world at 10,000 species, a number smaller than is now known to exist in Britain alone. In the 18th c., the name of Linnæus occupies as high a place in the history of entomology as in that of kindred branches of science. The progress of the science was much promoted by his arrangement and exhibition of the discoveries of previous and contemporary naturalists; and by his system of classification, founded on characters taken from the wings, or their absence, a system professedly artificial, yet so harmonising with the most natural distribution into groups, that some of its orders were indicated by

Aristotle, and that it has retained and seems likely to retain its place, modified, indeed, but not essentially changed. De Geer and Fabricius are perhaps, after Linnæus, the most worthy to be named of the great entomologists of the 18th century. At the close of the 18th and beginning of the 19th c., the name of Latreille is pre-eminently conspicuous; and in the year 1815, a new impulse began to be given to the study of entomology in Britain by the publication of the admirable *Introduction to Entomology* of Messrs Kirby and Spence, a work combining in a remarkable degree the merits of being at once popular and scientific. Since the beginning of the 19th c., the number of insects known and described has prodigiously increased; many entomologists have with great advantage devoted themselves particularly to the study of particular orders of insects; and many valuable monographs have appeared. Entomological literature has now become very extensive. The progress of the science has owed not a little to entomological societies, of which the Entomological Society of London may be particularly mentioned. We cannot attempt to enumerate the distinguished entomologists of the 19th c., but perhaps the names of Leach, Macleay, Curtis, Stephens, Westwood, Smith, Walker, Stainton, Swainson, and Chuckard, deserve particular notice among those of Britain; Meigen, Jurine, Gyllenhal, Gravenhorst, Hubner, Dufour, Boisduval, Erichsen, and Lacordaire among those of the continent of Europe; and Say among those of America. It is to be regretted that we have not yet any complete work on the insects of Britain. The *Insecta Britannica*, of which some volumes by different authors have been published under the auspices of the Entomological Society, is intended to supply the want.

ENTOMO'STRACA (Gr. insect-shells), a term introduced by Müller, and adopted by Latreille, Cuvier, and other naturalists, to designate the second of their two great divisions of Crustaceans (q. v.). The number of species of E. is very great. They are all of small size, except the King-crabs (*Limulus*), which in many respects differ from all the rest, and have recently been formed by some naturalists into a sub-class of crustaceans by themselves. Many of them are minute, and exist in great numbers both in fresh and salt water, particularly in stagnant or nearly stagnant fresh water, affording to many kinds of fishes their principal food. They differ very much in general form; the number of organs of locomotion is also very various—in some very few, in some more than one hundred—usually adapted for swimming only, and attached to the abdominal as well as to the thoracic segments; but there never is a fin-like expansion of the tail, as in some of the malacostracous crustaceans. The antennæ of some are, however, used as organs of locomotion. Some of the E. have mouths fitted for mastication, and some for suction. Not a few are parasitic. The heart has the form of a long vessel. One or two nervous knots or globules supply the place of a brain. The organs of respiration are in certain species attached to some of the organs of locomotion, in the form of hairs, often grouped into beards, combs, or tufts, or blade-like expansions of the anterior legs are subservient to the purpose of respiration: in others, no special organs of respiration are known to exist. The eyes are sometimes confluent, so as to form a single mass—one eye—in the front of the head. The name E. has been given to these creatures in consequence of most of the species having shells of one or two pieces, rather horny than calcareous, and of very slender consistence, generally almost membranous and transparent. In very many, the shell consists of two valves, capable of being completely closed, but which, at the pleasure of the little animal, can also be opened so as to permit the antennæ and feet to be stretched out.

The study of the smaller crustaceans has recently been prosecuted with great assiduity and success, by Milne-Edwards and others; and in consequence of the great differences existing among them, new classifications have been proposed, and the name E. has by some been restricted to those which have a mouth formed for mastication, but no special organs of respiration, forming a section which is subdivided into two orders, *Ostrapoda* and *Copepoda*, the former having a bivalve shell or shield, the latter destitute of it.—But the name E. is still commonly employed in its former wider sense.

ENTOMOSTRACA, Fossil. E. attained their maximum size in the palæozoic waters, which they tenanted in vast shoals. The Silurian Trilobite (q. v.) was a phyllopod, and the Pteregotus (q. v.) of the old red sandstone was nearly allied to the modern limulus. Small bivalvular species are found in all strata, sometimes, as at Burdie-House, near Edinburgh, forming layers of considerable thickness, at others scattered in enormous numbers in the dried sediments of lakes, as in the fresh-water clays of the Wealden, or forming in some places a large proportion of chalk, with the multitudes of their thin calcareous coverings.

E'NTOPHYTES (*Entophyta;* Gr. *enton*, within, and *phyton*, a plant), a term usually employed to denote those parasitic plants which grow on living animals. It is seldom extended to vegetable parasites which grow on living vegetables, whether on external or internal parts, nor is it restricted to those which are found in the internal cavities, or within the substance of animal bodies, but includes all which have their seat on living animal tissues. It does not, like the analogous term *Entozoa*, denote any particular class of organised beings; some of the E. are *Algæ*, and some *Fungi*, but to these two orders they are limited, and all of them belong to the lower sections of these orders; some of them to those lowest sections in which the distinguishing characters of the two orders cannot easily be traced, so that they are referred to the one or the other on very slender grounds; those in which a colouring matter is present being reckoned algæ, although it can be observed only in masses of aggregated cells, and not in the cells when viewed separately, and those which even in the mass appear entirely colourless, being considered fungi. Many of the algæ and fungi parasitic on plants are nearly allied to those which occur on animals; thus, ergot and the kind of mildew which has proved so destructive to vines, are referred to the same genus (*Oidium*) to which is also referred the fungus found in the diseased mucous membrane in cases of *aphthæ* or *thrush:* and another genus (*Botrytis*, q. v.) contains the fungus called Muscardine, or Silkworm Rot, so destructive to silkworms, together with the fungus which accompanies or causes the potato disease, and many other species which infest plants. Common mould is even supposed to occur on animal tissues tending to decay, during life, as well as on dead animal and vegetable substances.

Vegetable parasites occur both in man and in the lower animals; not a few of them are peculiar to fishes, and more are peculiar to insects than to any other class of animals. The fungi which grow on the bodies of insects sometimes attain an extraordinary development: *Sphæria Sinensis*, which grows on a Chinese caterpillar, and to which medicinal virtues, probably imaginary, are ascribed in China, attains a length greater than that of the caterpillar itself. A similar species (*S. Robertsii*) is found on the caterpillar of a New Zealand moth.

The situations in which E. occur are very various. Some, like the thrush fungus already noticed, appear in diseased conditions of the mucous membrane; some find their place in the lungs, the ear, or other organs; some on the skin, in the hair follicles, and *in* as well as *on* the hair itself. The 'fur' which appears on the tongue when the stomach is disordered, abounds in the extremely slender unbranching threads of the alga called *Leptothrix buccalis*, which also vegetates luxuriantly in cavities and corners of the teeth not sufficiently visited by the tooth-brush. The lungs of birds, the gills of fishes, the intestines of insects, the wing-covers of beetles, the eggs of molluscs, all have their peculiar vegetable parasites by which they are sometimes infested.

It is often by no means easy to say whether the presence of E. is to be regarded as the consequence or as the cause of disease; sometimes it may be both. Sometimes it appears to be certainly a consequence, as when the *Sarcina* (or *Merismopœdia*) *ventriculi* occurs in the contents of the stomach and bowels; sometimes, as in the diseases called *Favus*, *Porrigo*, *Tinea*, *Herpes tonsurans*, *Plica Polonica*, *Mentagra*, *Pityriasis versicolor*, &c., it seems entitled to be regarded as the cause of the diseased state, and the cure of the disease seems to be accomplished by killing the parasite, often a thing of no little difficulty.

Whence the germs of E. are derived is often a question to which it would not be easy to find an answer. Their spores are extremely minute; but there are no plants which produce seeds or spores more abundantly than some of them do; the growth of the plants themselves is very rapid, and reproduction is 'very intense and rapid.'

It has sometimes been imagined that epidemic diseases may be caused by spores of E. conveyed through the air; no evidence has, however, been produced to render this opinion probable. An attempt was made to establish the existence of cholera fungi or algæ, but it completely failed.

ENTOZO'A. This term is applied to all the animal forms which live either in the natural cavities (as, for example, the intestinal canal), or in the solid tissues (as, for example, the liver) of other animals. The number of these parasites is so great (there being at least 20 distinct species of worms found in man, 14 in the dog, 15 in the horse, 11 in the common fowl, &c.), and their occurrence so frequent, especially in some of the lower animals, that we must regard their presence, at all events in many species, rather as the normal condition, than as a morbid state due to accidental causes.

It is worthy of notice, that many of the animals included amongst the E. only enjoy a parasitic existence during a part of their total life, which often, as in the well-known case of perfect insects, presents very varied and distinct phases. Thus, for example, the larvæ of the gadfly (*Œstrus equi*) undergo their entire development in the stomach of the horse, attaching themselves by minute hooks to the gastric mucous membrane; they then detach themselves, pass along the intestines, and in due time are discharged, and undergo their further changes externally; and many similar instances might be quoted. For this reason, and additionally because parasites are now known to belong to various classes of animals, we no longer attempt, like Linnæus and Cuvier, to form a special group of E.; and a reference to the *Vermes intestinæ* in the *Systema Naturæ*, or to the *Entozoaires* in the *Règne Animal*, at once shews that these illustrious naturalists grouped together animals with few or no true natural affinities.

Although most E. belong to the class of *Vermes*, or *Worms*, this, as has been already observed, is by no means exclusively the case. Thus, even fishes may lead a parasitic existence; a fish of the genus *Fierasfer* being frequently found in the respiratory cavity of the *Holothuria tubulosa*, or *Sea-cucumber*, and small fishes having been frequently observed in the cavity of the *Asteria discoïdes.* Amongst the crustaceans, instances of parasitism are by no means rare; different species of *Lernæa* being abundant in the branchial (or gill) cavity, and on the surface of numerous fishes, while the *Linguatulæ* infest mammals, reptiles, and fishes, being found in the olfactory sinuses, the larynx, the lungs, the peritoneal cavity, &c. The instances in which molluscs are found to live parasitically are few; certain gasteropods, however, inhabit the bodies of echinoderms, holothurias, and comatulas; and amongst the lamellibranchiates, species of modiolaria and mytilus live in the bodies of ascidians. There are several cases of polyps which have been observed to adopt a parasitic existence; and finally, various protozoa are not unfrequently met with in the animal fluids; for example, certain species of *Vibrio*, *Cercomonas*, and *Paramecium*, have been found in the intestinal evacuations in cholera and diarrhœa; *Monads* have been found in the urine in cholera, and certain infusoria and rhizopoda in the blood of the dog, the frog, and many other animals. See HÆMATOZOA.

The more common kinds of E. appear to have attracted the notice of the earliest physicians and naturalists whose opinions or works have reached us. Hippocrates speaks of several worms, especially the tæniæ and ascarides, infesting the human intestinal canal; and Pythagoras learned in India that the bark of the pomegranate acted almost as a specific in cases of tape-worm. Aristotle noticed both the tape-worm of the dog and of man, and the *Cysticercus cellulosæ* (see CESTOID WORMS) of the pig; but utterly unconscious that the cysticercus, under favourable conditions, became developed into a tape-worm (see TAPE-WORMS), referred the origin of all intestinal worms to spontaneous generation—a doctrine that seems to have been generally adopted till the 17th c., when Redi published (in 1684) a work on Helminthology, in which he distinctly shewed that the generation of various E. followed the same laws as in higher animals, and that in many instances there were distinct males and females. The great recent discovery, that the vesicular or bladder-like parasites, such as the different species of cysticercus and cœnurus, are cestoid worms in an early stage of development, is alluded to in CESTOID WORMS, and will be more fully noticed in the article TAPE-WORMS.

Another point of general interest in connection with E., is the part of the body in which they are found. While most live in the intestinal canal and other open cavities (as the larynx, bronchial tubes, &c.), others are found in the closed cavities and in the parenchymatous tissue of the liver and other solid organs. Thus (confining our remarks to the E. occurring in man), *Anchylostoma duodenale*, *Strongylus duodenalis*, *two species of Ascaris*, *Oxyuris vermicularis*, *Trichocephalus dispar*, *Distoma heterophyes*, at least four species of *Tænia*, and *Bothriocephalus latus*, have been found in different parts of the intestinal canal; while *Strongylus gigas* inhabits the kidney, another species of *Strongylus* the lungs, a species of *Spiroptera* the bladder, two species of *Filaria* and *Monostoma Lentis* the eye, *Trichina spiralis* the voluntary muscles, two species of *Echinococcus* and *Cysticercus cellulosæ*, various parenchymatous tissues, two species of *Distoma* the gall-bladder, another species the portal vein, and the *Filaria Medinensis*, or *guinea-worm*, the subcutaneous tissue.

Davaine, who may be regarded as one of the highest living authorities on this subject, gives the following synopsis of the E. occurring in man and the domestic animals (see his *Traité des Entozoaires*, Paris, 1860).

Type I. Protozoa, including the genera *Bacterium*, *Vibrio*, *Monas*, *Cercomonas*, *Trichomonas*, *Paramecium*.

Type II. Cestoidea, including the families of *Tæniadæ* and *Bothriocephalidæ*. The *Tæniadæ* occur (1) in their undeveloped, cystic, or vesicular form, constituting the genera *Cœnurus* and *Cysticercus;* and (2) in their perfect, ribbon-like shape, constituting the genus *Tænia*, of which about 20 species have been described. The *Bothriocephalidæ* contain the single genus *Bothriocephalus*, which embraces various species. Their early or vesicular stage has not yet been described.

Type III. Trematodea, including two well-marked secondary types: (1) The *Polystomidæ*, which live as epizoa on the skin or gills of aquatic animals, and which do not concern us here; and (2) the *Distomidæ*, including the genera *Monostoma*, *Distoma*, *Holostoma*, *Amphistoma*, with the doubtful genera of *Tetrastoma* and *Hexathrydium*.

Type IV. Acanthocephala, with the single genus *Echinorhynchus*.

Type V. Nematoidea. Passing over two cases in which these worms have been discovered, apparently in their larval or imperfectly developed state (once by Rainey in the human trachea, and once by Vulpian in the kidney of the dog), Davaine gives the following genera, *Oxyuris*, *Ascaris*, *Spiroptera*, *Trichina*, *Trichosoma*, *Trichocephalus*, *Filaria*, *Dochmius*, *Sclerostoma*, *Strongylus*, *Anchylostoma*, *Dactylius*.

Type VI. Acanthotheca, including the genus *Pentastoma*.

Alarming as the above list may seem, comparatively few of the worms contained in it do in reality give rise to dangerous or severe symptoms. It seems to be a condition of parasitism, that the animal upon which the parasite lives must not be destroyed by it; and it has been suggested by one of our highest authorities on this subject, Van Beneden, that in many cases the parasite does not so much attack the organism in which it exists, as its superabundant products. Dujardin and other helminthologists have described cases in which worms were developed by thousands in persons apparently in good health. The symptoms occasioned by Ascarides, Tæniæ, &c., are described in the articles Ascaris, Tape-worms, &c.

The multiplication of worms is most rapid in debilitated persons, especially children living in cold and damp situations; and impure water, unripe fruits, and raw or imperfectly cooked meat, have considerable influence on the development of these animals. For the description of the medicines used for their destruction, see the article Vermifuges; and for information regarding the structure and habits of the most important E., see the articles Ascaris, Bothriocephalus, Cestoid Worms, Filaria, Monostoma, Nematoidea, Spiroptera, Strongylus, Tape-worms, Trematoidea, Trichina, Trichocephalus.

ENTR'ACT, in Music, is an instrumental piece, composed in the form of a little symphony or overture, to be performed between the acts of a play.

E'NTRÉ DOU'RO E MI'NHO, or, as it is frequently called, Minho, a province of Portugal, in the extreme north-west of the country, is bounded on the N. by Galicia, from which it is separated by the river Minho; on the E. by Galicia and Tras os Montes; on the S. by the province of Beira, from which it is separated by the river Douro; and on the W. by the Atlantic Ocean. It has an area of about 3094 square miles, and a population of 857,132. It has been called the Paradise of Portugal, and indeed it may be doubted whether any territory in Europe of equal extent exhibits so much beauty. It is traversed from north-east to south-west by three mountain-ranges, which, however, sink down as they approach the coast, leaving a considerable tract of undulating country along the sea-margin. The chief rivers, besides those already mentioned as forming the northern and southern boundaries of the province, are the Lima—a portion of the vale of which is said to form the loveliest landscape in the world—the Cavado, and the Tamego. The climate is agreeable and healthy. The chief productions are wine, oil, flax, maize, wheat, barley, oats, and vegetables. Wine, which is shipped at Oporto, is largely exported. Along the coast are numerous fisheries, at which great numbers find employment. The province of Minho consists of three districts, Braga, Vianne, and Porto, with the town of Braga for the capital.

ENTRE RI'OS (the Spanish for *Between Rivers*) takes its name from its occupying the space between the Parana and the Uruguay, immediately above the point where they unite to form the Plate. It is one of the states of the Argentine Confederation. The area is estimated at 32,000 square miles, and the population at 80,000 inhabitants. The country is almost entirely pastoral—its principal productions being hides, horns, tallow, and jerked beef. The soil is not well fitted for cultivation, for, besides being rather swampy throughout, it is subject, in the south, to annual floods. The capital is Bajada de Santa Fé or Parana, the other principal towns are Gualeguay, Gualeguarchu, and Concepcion de la China.

ENTREMETS, ENTRÉES, French terms now used in England to designate certain courses of dishes served at fashionable dinners. The chief dishes are *entrées*, and the lighter dishes are *entremets*.

ENTRESOL. See Mezzanin.

ENTRO'PIUM, or **ENTRO'PION** (Gr. *en*, in, and *trepō*, I turn), inversion of the eyelashes, or even eyelid, consequent either on loss of substance, or on inflammatory swelling of the lid. If confined to one or two eyelashes, they should be plucked out by the roots, and the bulbs should be cauterised; but the radical cure of severe entropium requires a careful adaptation of the surgeon's art to the circumstances of the particular case, and should not be attempted by unskilled hands.

ENTRY, Right of. A person is said, in English law, to have a right of entry who has been wrongfully dispossessed or ousted of land and tenements by Abatement, Intrusion, or Disseisin. See the several articles under these heads. A right of entry was formerly lost by suffering a descent cast, i. e., where the tenant tortiously in possession is permitted to continue unmolested till his death, and is succeeded by his heir. This result of suffering a descent cast is removed, 3 and 4 Will. IV. c. 27, and right of entry is now lost by not asserting it for twenty years.

ENTRY OF AN HEIR. In the feudal law of Scotland, this term was applied to the recognition of the heir of a vassal by the superior or dominus. Strictly, the whole rights of the vassal in the property return to the superior on his death, and must be renewed to his heir. The renewal, however, is not optional, it is merely an occasion of exacting dues of entry from the heir, which tend, of course, to diminish the value of the property, and of putting fees into the pockets of conveyancing lawyers, who are the only real gainers by the arrangement. See CONVEYANCING.

E'NVELOPES. Until the introduction of the penny-postage system, envelopes for written letters were very little adopted; it was far more customary to secure, by wafer or sealing-wax, the sheet of paper on which the letter was written. When the postage was rendered uniform for all distances, and prepayment enforced, or at least recommended, it was supposed that stamped envelopes would be convenient coverings for letters, sealing the letter and paying the postage at one operation. Such has indeed been the case; but the envelope-manufacture has since taken a new direction, and to an extent that no one could have contemplated. Several large firms in London and elsewhere can make envelopes more cheaply than the government, and can vary the size, shape, colour, and quality to an indefinite degree; as a consequence, although envelopes bearing the government impressed stamp are still in demand, the unstamped varieties are used in very much larger quantities. They are made by two methods, involving different amounts of machine-power. The paper is first cut into quadrangular pieces rather longer than wide, by a cutting blade brought to bear upon a pile of sheets at once; and then cutting-dies reduce these pieces to the proper shape, generally lozenge or diamond form, but sometimes with curvilinear edges. For some kinds, it is found to economise both time and paper to stamp the pieces out at once from the rough sheets. The subsequent folding and gumming are performed generally by hand, sometimes by machine. In the hand-method, women and girls fold with almost incredible quickness, having very simple guide-pieces to aid them in giving the proper oblong quadrangular shape to the fold. The gum is applied with a small brush, either all along the overlapping edges, or in spots here and there, according to the quality of the envelope.

The envelope-machines, however, such as those of Messrs De la Rue, are beautiful examples of automatic mechanism. In the kind invented and used by this celebrated firm, a cutting-machine severs the blanks or papers; and dies are employed to stamp the device on the spot where the seal would otherwise lie. The blanks are then fed into the folding-machine, where they pass through a curious series of processes. Each blank is carried down into a box, where a plunger makes four creases in it; two short levers fold down two of the flaps thus made; a gumming apparatus comes up, and applies a line of wet gum to each flap-edge; two small levers then fold down the other two flaps (but only fastening one of them); and finally, the envelope is shifted aside to a pile, and makes way for another. All these processes are gone through in *one second*, enabling the machine to make sixty envelopes per minute. Where twelve of these machines are working at once, it will be seen that a million envelopes are put out of hand in a very short time. Nearly a million and a half of enveloped letters pass through the post every *day* in the United Kingdom, most of the envelopes for which are of home manufacture; and besides this, a large export trade is maintained. The stamped envelopes all go to Somerset House, to have the stamp impressed upon them, which is done by a beautiful machine, chiefly invented by Mr Edwin Hill, in which embossing and colour-printing are ingeniously combined. These envelopes are sold by the Stamp-office, between which and the Post-office a monetary adjustment becomes necessary.

E'NVOY, a diplomatic minister of the second order, i. e., inferior in rank to an ambassador. Envoys, ordinary and extraordinary, ministers plenipotentiary, the internuncios of the pope, and all other inferior diplomatic ministers, differ from ambassadors in this, that although they receive their credentials, like ambassadors, immediately from their sovereign, they represent not his personal dignity, but only his affairs. They stand to him just as an ordinary agent does to his principal, and their acts or promises are his in a business, though not in a personal sense. It is said that this class of diplomatists was first introduced by Louis XI. of France, towards the end of the 15th century. The envoy is superior in rank to the chargé d'affaires, whose credentials proceed from the ministers of the state from which he is sent, and are addressed to the ministers of the state to which he is sent; or are a mere delegation from an ambassador or envoy to conduct the affairs of the mission in his absence. Consuls (q. v.) are not generally reckoned among diplomatic ministers, though, where they have diplomatic duties to perform independently of an ambassador or envoy, they are accredited, and treated as ministers. According to the division of diplomatic agents into four classes, which was made by the great powers at the congress of Vienna in 1815—viz. 1. Ambassadors, legates, and nuncios; 2. Envoys, ministers, and other agents accredited to sovereigns; and 3. Chargés d'affaires, accredited by and to the departments of Foreign Affairs—an envoy would be of the second, and a chargé d'affaires of the third rank. But the practice of this country has interjected between the ambassador and the envoy a second class, called envoys extraordinary and ministers plenipotentiary, which, of course, throws the ordinary envoy into the third, and the chargé d'affaires into the fourth class. See CHARGÉ D'AFFAIRES, AMBASSADOR, EMBASSY, and CONSUL.

ENYED. See NAGY-ENYED.

E'OCENE (*eos*, dawn, and *kainos*, recent), a term introduced by Lyell to characterise the Lower Tertiary strata, from the idea that the fossil shells of that period contain an extremely small proportion (3½ per cent.) of living species. He accordingly looks upon these beds as indicating the dawn of the existing state of the testaceous fauna—no recent species having been detected in the older rocks. The gradual approximation of the living inhabitants of the globe to the present forms is the chief characteristic of the Eocene and newer deposits. The Eocene beds rest on the chalk. Like the other Tertiary strata, these deposits occupy small and detached areas when compared with the older measures. It is not difficult to determine the relative position of Primary or Secondary strata, because of the great extent of particular beds, being frequently continuous over extensive districts. But Tertiary deposits are more isolated, and occur in smaller and more detached patches; hence it is difficult to determine the contemporaneity of the sections of the various periods, occurring as they do in different isolated localities. Their relations must be determined from the petralogical structure of the beds, which, however, is very inconstant, or from the more satisfactory evidence derived from their fossiliferous contents.

In the following table are given the generally received divisions of this period, with the maximum thickness (in English feet) of the English strata, and the French and Belgian equivalent beds:

UPPER EOCENE.	1. Hampstead series,	175	Calcaire lacustre superieur, and Grès de Fontainebleau.—Rupelien.
	2. Bembridge series,	115	Gypseous series of Montmartre, Calcaire lacustre moyonne, and Calcaire siliceux.—Tongrien.
MIDDLE EOCENE.	3. Osborne series, .	70	Grès des Beauchamp.
	4. Headon series, .	182	
	5. Bagshot series, .	1270	Sables moyennes, Calcair-grossier, and Lits coquilelières.—Laeckenien and Bruxellien.
	6. London clay series,	480	Wanting in France.—Ypresien.
	7. Plastic clay series,	160	Argile plastique et lignite.—Landenien superieur.
	8. Thanet sands series,	90	Wanting in France.—Landenien inferieur.
	Total thickness,	2542 feet.	

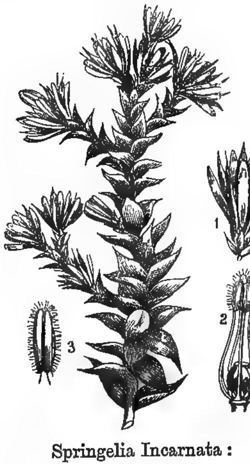
EO'LIAN HARP. See ÆOLIAN HARP.

EON DE BEAUMONT, CHARLES GENEVIÈVE LOUIS AUGUSTE ANDRÉ TIMOTHÉE D', known as the *Chevalier d'Eon,* was born at Tonnerre, in Burgundy, in 1728, studied law, and became an advocate. He attracted the notice of the Prince of Conti by some political writings; and in 1755, was introduced by the latter to Louis XV., who employed him in diplomatic missions to Russia and Austria. After serving a short time in the army, not without distinction, he was sent to London in 1761 as secretary of embassy, and shortly after was made minister-plenipotentiary. Becoming the victim of a court cabal, however, which deprived him of his office, he took his revenge by publishing his secret correspondence with the French court, which contained, among other things, libels on various persons. For one of these, he was prosecuted in London; and to avoid judgment, fled to the continent. He, however, returned to England again; but, on the death of Louis XV., the French ministry deemed it prudent to recall him, as they were afraid he might betray their secrets to the English government, which made him brilliant offers. The pretext laid hold of for this purpose, was the scandal excited in London by his having assumed the garb of a woman, which he had done at the request of Louis, the better, it may be presumed, to hide his designs as a 'secret agent.' On his return to France, however, Eon was very favourably received; and Louis XVI. even ordered him to make use of the feminine garb in future. In 1783, he again proceeded to London, not, however, in any visible official capacity; and, though dressed as a woman, gave lessons in fencing, of which art he was a complete master. On the outbreak of the French Revolution, he hastened home, and offered his services to the nation; but as nothing came of his offer, he finally returned to London, where he sank into the greatest misery, and died 21st May 1810. An examination of Eon's remains by Mr J. Copeland, a surgeon, settled the question of his sex, and put an end to the curiosity of the English public. His writings appeared at Amsterdam 1775, under the title of *Loisirs du Chevalier d'Eon.* The *Mémoires* which bear his name are not genuine.

EOO'A, or **MI'DDLEBURG,** one of the Friendly or Tonga Islands, is 30 miles in circuit, and contains 300 inhabitants. It is in lat. 18° 19′ S., and long. 175° 37′ W. The surface, which is rocky and barren, rises 600 feet above the sea. The group, as a whole, was discovered by Tasman in 1643.

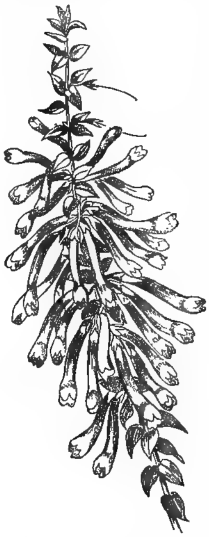
EÖTVÖS, JOZSEF, a highly distinguished Hungarian author, was born 3d September 1813 at Buda; educated at home by a tutor of republican sentiments, and studied philosophy and jurisprudence at the university of Pesth during the years 1825—1831. He became an advocate in 1833, but soon resolved to devote himself exclusively to literature, in which field he had already won a great reputation by his comedies *Kritikusok* (The Critics) and *Házasulók* (The Weddings), and also by his tragedy *Boszú* (Revenge). After his return from a journey through Germany, France, England, Switzerland, and the Netherlands, he published his *Prison Reform* (*Gefängnissreform,* Pesth, 1838), which was instrumental in bringing about many wholesome improvements in regard to prisons. This was followed (1838—1841) by his novel entitled *The Carthusian,* which excited great interest, and was pronounced to be one of the best productions of Hungarian literature. E. now began to distinguish himself in politics. When the Liberal party split, in 1844, into Municipalists and Centralists, he became one of the most eloquent advocates of the policy of the latter party, and wrote numerous articles in favour of it in the *Pesti Hirlap,* which are marked by varied learning, fulness of thought, and elegance of expression. They were issued in a collected form at Leipsic in 1846, under the title of *Reform. The Village Notary* (A' Falu' Jegyzöje, 3 vols., Pesth, 1844—1846; English by Otto Wenckstern, 1850; German by Mailath) is a work of the highest order of merit. For variety of incident, easy vigour of style, humour, liveliness, and freshness of descriptive power, it has been pronounced equal to the best of the *Waverley Novels.* It was followed in 1847—1848 by his *Magyarország 1514—ben* (Hungary in 1514), which describes the insurrection of the peasants that happened in that year in a masterly style. When the revolution of 1848 broke out, E. was appointed Minister of Public Instruction, but soon became aware of his own incapacity for the work of a practical statesman, and abandoning his country, which he deemed it impossible for him to serve, retired for some time to Munich, where he employed himself exclusively in literary pursuits. The most important fruit of his residence here was *Der Einfluss der Ideen des 19 Jahrh. auf Staat und Gesellschaft* (The Influence of the Ideas of the 19th Century on the State and on Society, Pesth and Vienna, 1851). In 1851, E. returned to Hungary, but has not since mingled in politics. See Csengery's *Ungarns Redner und Staatsmänner* (Orators and Statesmen of Hungary, Vienna, 1851).

EPACRIDA'CEÆ, a natural order of exogenous plants, consisting of shrubs and small trees, which, both in appearance and in botanical characters, much resemble the *Ericeæ,* or Heath family. The



Springelia Incarnata:
1, flower and calyx; 2, anther; 3, stamens and ovary.

most important distinguishing structural character is indeed found in the simplicity of the anthers, which are one-celled, open longitudinally, and are destitute of appendages. The flowers of the E. have generally a tubular corolla, dividing into five—rarely four — segments; which, however, sometimes become separate petals. The calyx is persistent, often coloured, has the same number of segments with the corolla, and is surrounded with small bracts. The stamens are fewer than in the *Ericeæ*, usually equal in number to the segments of the corolla, and alternate with them. The fruit is sometimes a capsule, sometimes a berry, sometimes a drupe. The leaves are simple, generally alternate, often crowded; the flowers in spikes, in terminal racemes, or axillary and solitary.—About 400 species of E. are known, all natives of the Indian Archipelago, the South Sea Islands, and Australia; in which regions they seem to occupy the place of the heaths of other parts of the world. Some, particularly of the genus *Epacris*, are well-known ornaments of our greenhouses, and are flowering shrubs of great beauty. Some produce edible berries resembling the cranberry. See CRANBERRY.



Epacris Grandiflora.

E'PACT, in Chronology, is the excess of the solar month above the lunar synodical month; or of the solar year above the lunar year of twelve synodical months; or of several solar months above as many synodical months; or of several solar years above as many periods, each consisting of 12 synodical months. The menstrual epact is the excess of the civil calendar month above the lunar month. For a month of 31 days, this epact is 1 day 11 hours 15 minutes 57 seconds, if we suppose new moon to occur on the first day of the month. The annual epact is the excess of the solar year above the lunar. As the Julian solar year is (nearly) 365 days, and the Julian lunar year is (nearly) 354 days, the annual epact is nearly 11 days. The epact for two Julian years is, therefore, nearly 22 days; for three years, 33 days; and so on. When, however, the epact passes 30 days, 30 falls to be deducted from it, as making an intercalary month. For three years, then, the epact is properly 3; and for 4 years, adding 11 days, it is 14 days; and so on. Following the cycle, starting from a new moon on the 1st of January, we find that the epact becomes 30 or 0 in the 19th year. The epact for the 20th year is again 11; and so on. The years in the cycle are marked by Roman numerals, I. II. III., &c., called the Golden Numbers; and a table of the Julian epacts exhibits each year in the cycle with its golden number and epact. As the Gregorian year (see CALENDAR) differs from, and is in advance of, the Julian by 11 days (the number lost on the Julian account before the Gregorian computation of time was introduced in England), and as 11 days is the difference between the solar and lunar years, it follows that the Gregorian epact for any year is the same with the Julian epact for the year preceding it.

EPAMINO'NDAS, the most eminent of Theban generals and statesmen, and one who for a long period elevated his country to the highest point of honour and prosperity, was born 414 B. C. He was descended from an ancient but impoverished family, and led a retired life till his 40th year, profiting by the instructions of Lysis the Pythagorean, who inspired him with enthusiasm for the elevated ideas which it was the object of his life to realise. E. first becomes prominent during the period when the Lacedemonians garrisoned the citadel of Thebes, and kept the inhabitants in subjection. Though he took no part in the desperate but successful stratagem by which his fellow-citizens recovered the *Cadmeia* in 379 B. C., he stepped forward immediately after into the ranks of the patriots; and when sent to Sparta in 371 B.C. along with several others, in order to negotiate a peace between the two countries, E. displayed as much firmness and dignity as eloquence in the debate which ensued upon the question whether Thebes should ratify the treaty in the name of all Bœotia, the result of which ratification would have been equivalent to a recognition of her claim to supremacy over the Bœotian towns. To this the Lacedemonians demurred, and the war was again resumed; E. was appointed commander-in-chief; and, in conjunction with his friend Pelopidas, with an army of 6000 men, defeated double that number of the enemy at Leuctra (371 B. C.). Two years later, he and Pelopidas marched into the Peloponnesus, incited several of the allied tribes to fall away from Sparta, and then turned his arms against that city, which, however, was bravely defended by Agesilaus. On his return to Thebes, E. was accused of having violated the laws of his country, by retaining the supreme power in his hands beyond the time appointed by law; but was acquitted in consequence of his open and animated defence. In the spring of 368 B. C., the war was renewed with increased fury between Thebes and Sparta, and E. once more marched into the Peloponnesus, but did not accomplish much; and on his return home, received a check from Chabrias at Corinth. To atone for this unsuccessful undertaking, he advanced with 33,000 men into Arcadia, and joined battle with the main body of the enemy near Mantineia, in the year 362 B. C. E., at the head of his troops, succeeded in breaking the Spartan phalanx, but was mortally wounded in the breast by a javelin. Being told by the physicians that he would die as soon as the weapon was extracted, on receiving intelligence that the Bœotians had gained the victory, he is said to have torn out the javelin with his own hand, exclaiming: 'I have lived long enough.' His moral purity, justice, and clemency are extolled by the ancients as much as his military talents; and it is expressly recorded of him, that he never told a lie, even in jest. Compare Bauch, *Epaminondas und Thebens Kampf um die Hegemonie* (Breslau, 1834).

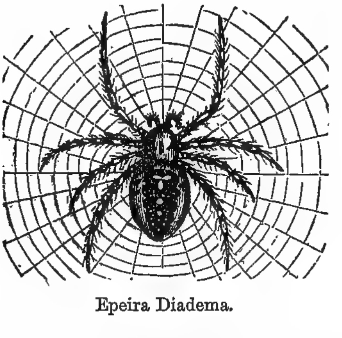
EPAU'LEMENT (from the French *épaule*, shoulder), in siege-works, is a portion of a battery or earthwork. The siege-batteries are generally shielded, at one end at least, by epaulements, forming an obtuse angle with the main line of the battery. The object is to protect the guns and gunners from a flanking fire. The name is often given erroneously to the parapet of the battery itself, but it applies properly to the flanking return only. Sometimes the whole of a small or secondary earthwork, including the battery and its flanks, is called an epaulement; and sometimes the same name is given to an isolated breast-work intended to shield the cavalry employed in defending a body of besiegers.

An *épaule* is the shoulder of a bastion, where one of the faces and one of the flanks meet; and this points to the proper meaning of epaulement, as a shoulder or flanking work.

E'PAULETTE, from the same French source as epaulement, is a shoulder-knot worn by commissioned officers in the naval profession, both as an ornament and a distinction. In the British navy, the officers of and above the rank of lieutenant wear epaulettes of gold lace, one on each shoulder, sub-lieutenants wearing one only. Ranks and degrees are marked in a very systematic way by means of crowns, anchors, and stars worked in silver on the epaulette, and also by the size of the cords of the epaulette itself. This decoration was formerly universal in the British army, officers wearing those of gold, men of worsted; but they were abolished at the time of the Russian war, in consequence of the danger to which officers thus easily marked out were exposed from the enemy's sharpshooters. Militia officers wore epaulettes of silver cords.

EPÉE, Charles Michel, Abbé de l', one of the founders of the system of instruction for the deaf and dumb, was born at Versailles, 25th November 1712. He studied for the church, and entering into holy orders, became a preacher and canon at Troyes, but eventually, on account of his Jansenist opinions, was deprived of this appointment. He now lived in retirement in Paris. In the year 1755, he first began to occupy himself with the education of two deaf and dumb sisters; and, as he asserts, without any previous knowledge of Pereira's efforts in the cause, invented a language of signs, by which persons thus afflicted might be enabled to hold intercourse with their fellow-creatures. His first attempts being crowned with success, he determined to devote his life to the subject. At his own expense, he founded an institution for the deaf and dumb, and laboured with unwearied zeal for its prosperity. His favourite wish, however, the foundation of such an institution at the public cost, was not fulfilled till after his death, which took place 23d December 1789. He wrote a work, entitled *Institution des Sourds et Muets* (2 vols., Paris, 1774), which afterwards appeared in an improved form under the title, *La Véritable Manière d'Instruire les Sourds et Muets* (Paris, 1784).

EPEI'RA, a genus of spiders, the type of a family called *Epeiridæ*. They are of those spiders which have only a pair of pulmonary sacs and spiracles; construct webs with regular meshes, formed by concentric circles and straight radii; and are furnished with a pair of almost contiguous eyes on each side, other four eyes forming a quadrangle in the centre. Many of them are remarkable for the beauty of their colours and of their forms. Several species abound in our gardens, particularly in autumn. *E. diadema* is one of the largest British spiders. It is found in moors, the borders of woods, &c.; but it is in tropical countries that the *Epeiridæ* exist in greatest numbers, and attain the greatest size and beauty, extending from branch to branch their lace-work, remarkable for gracefulness of design. The net, when loaded with wings, wing-covers, and limbs of insects that have been preyed upon, is often loosened, and falls down upon the central nest or den of the spider; and successive nets thus falling down, form at last a ball sometimes as large as a man's head. Some of the spider cords, carried horizontally from tree to tree at a considerable height from the ground, 'are so strong as to cause a painful check across the face when moving quickly against them; and more than once,' Sir J. E. Tennent says, 'in riding I have had my hat lifted off my head by a single thread.'—Tennent's *Ceylon*.



Epeira Diadema.

EPERÏES (Lat. *Fragopolis* or *Eperesinum;* Hung. *Eperjes*, *Slovak Pressova*), an old town of Hungary, in the county of Saros, of which it is the capital, is agreeably situated on the left bank of the Tarcza, about 150 miles north-east of Pesth. It is surrounded with walls, is the seat of a bishop, and contains some houses of the 15th and 16th centuries, built in the style of those in Naples, with which E. was much connected in the middle ages. Its principal buildings are the Church of St Nicholas, the communal college, with 500 students and a library consisting of 14,000 volumes, and the county hall. It has manufactures of earthen-ware and of linens and woollens, and has some trade in linen goods, corn, and Tokay wine. In the vicinity are the Sovar saltworks, which produce 5000 tons of salt annually. Pop. 9600, almost wholly Slavonic.

EPERNAY, a town of France, in the department of Marne, is the head-quarters of the *Vins de Champagne*, and is situated in the midst of a rich vine-growing district, on the left bank of the Marne, 19 miles west-north-west of Chalons. It is well built, clean, and well paved. Its environs consist, for the most part, of elegant villas, with vaults attached, belonging to the Champagne wine-merchants. E. manufactures large quantities of earthen-ware from a clay obtained in the neighbourhood, and called *Terre de Champagne;* also hosiery, refined sugar, and leather. It has a brisk trade in bottles, corks, wire, champagne wines, &c. Pop. 9346.

E'PHAH, a measure of capacity for dry goods in use among the Hebrews. It contained three English pecks and three pints.

EPHE'MERA (Gr. lasting for a day), a Linnæan genus of neuropterous insects, now forming the family or tribe *Ephemeridæ*. They are allied to the *Libellulidæ*, or Dragon-flies, but differ from them in many very important respects. They have received their name, to which corresponds the English Day-fly, sometimes also applied to them, from the brief duration of their existence in the perfect state, in which, very unlike the dragon-flies, they are believed to take no food, merely propagating their species, and dying. From the season of the year in which they begin to be seen, some of them are also called May-fly; and by this name are well known to anglers, who use them, and artificially imitate them as excellent lures for trout. The eggs of the ephemeræ are also a favourite food of fishes; they cohere together in a gelatinous mass. The larvæ and pupæ are aquatic, and in these states the ephemeræ have a much longer life than in their perfect state, extending even to years. The larvæ and pupæ are sufficiently voracious. The abdomen of the larva is furnished on each side with a set of leaflets, which serve instead of gills for respiration, and are also used in locomotion, although there are six feet attached to the thoracic segments. The pupæ differ little from the larvæ except in having rudimentary wings enclosed under scales. Both larvæ and pupæ have the abdomen terminated by two or three jointed filaments, which the perfect insect also has, sometimes very long. The body of the perfect insect is soft and slender; the wings resemble in form those of dragon-flies, but are soft and filmy; in repose, they are elevated vertically above the body: the second pair of wings are much smaller than the first, and in some species are altogether wanting; the organs of the mouth are so soft and small as not easily to be discerned, and to be apparently unfit for any kind of use. Ephemeræ, in their larva and pupa states, live chiefly under stones in water, or in burrows which they make in the banks of streams. When ready for their final change, they creep out of the water to undergo it on some plant or other object by the water-side, generally towards sunset on some fine day of summer or autumn. After having attained their winged state, however, they cast off a complete slough or envelope, so perfect, that it exhibits even the limbs, abdominal filaments, and antennæ; and these 'ghost-like exuviæ' are sometimes so abundant in the neighbourhood of streams, as to cover in 'a pearly layer' the hat and basket of the angler. The multitudes of ephemeræ are often very great, filling the air as a cloud; nay, so abundant are they at times, that their bodies have been known to cover the ground in certain districts of France, and have been gathered from particular spots in cart-loads to be used as manure.

EPHE'MERA, or **FEBRIS DIARIA** in Latin (from Gr. *epi* and *hemera*, on a day), a fever which lasts only a single day, or part of a day, and is generally dependent on some slight local irritation. It hardly requires any other treatment than the removal of the cause, if known.

EPHE'MERIS (Gr. 'for the day') is a name applied to almanacs from their containing notices for each day. It is mostly confined to astronomical tables giving the daily places of the sun, moon, and planets, and other phenomena of the heavens. Such tables have become common since the days of Kepler. The first were published by Purbach for the years 1450—1461. Those of Regiomontanus, for 1474, were much more accurate, and his Ephemerides met with universal acceptance. Similar publications were afterwards made by Leovitius, Origanus, Kepler, and others. The most important works of the kind at present are the French *Connaissance des Temps*, the English *Nautical Almanac*, the *Effemeridi di Milano*, and the Berlin *Astronomischen Jahrbücher*.

EPHE'SIANS, Epistle to the, is a letter addressed by St Paul, during his first imprisonment at Rome, to the church which assembled in Ephesus (q. v.). This church had been planted by the apostle himself, and, as we infer from various circumstances mentioned in the Acts of the Apostles, was an object of his special affection. The epistle was written almost at the same time as that to the Colossians, and consequently breathes the same spirit of exalted piety and fervid faith, besides containing many similar thoughts and exhortations. It may be divided into two grand parts, the first of which is for the most part *doctrinal*, and the second practical. The proofs of its *genuineness* and *authenticity* have generally been considered unquestionable; but recently De Wette, in his *Introduction to a Commentary on the Ephesians* (2d edit. 1847), has tried to shew that this epistle is simply an expansion of the grander epistle to the Colossians, though he admits that it has the appearance of having been compiled in the apostolic age.

E'PHESUS, one of the twelve Ionic cities of Asia Minor, was situated in Lydia, near the mouth of the river Caystrus, in the midst of an alluvial plain. It does not appear to have been as old as the Trojan war, but its primitive history has been confused by myths. It bore a great variety of names at different times, the principal of which, besides E., were Ortygia and Ptelea. According to Strabo, it was founded by Androclus, son of Codrus, and this is the most probable of the accounts which have come down to us, though others held to the tradition of its Amazonian origin. It was long before E. acquired any political importance, in spite of being a sacred city from an early period. Subdued first by the Lydian, and next by the Persian kings, it was included, after the death of Alexander the Great, in the territories of Lysimachus (281 B. C.), by whom it was greatly strengthened. Ultimately, it came into the possession of the Romans; and in the time of Augustus, when Strabo wrote, it was 'the greatest place of trade of all the cities of Asia west of the Taurus.' This was also its condition when visited by St Paul, who resided here three years; but the destruction of its great temple by the Goths, in 260 A. D., gave it a blow from which it never recovered. In 341 A. D., it was the scene of the *third* general council of the Christian Church. Its general history, while a city of the Byzantine empire, was unimportant, and before the days of Tamerlane it had almost completely perished.—The ruins of E. comprise a stadium 687 feet long, fragments of a great theatre (alluded to in the account of St Paul's preaching in the city), of an odeum or music-hall, and of various walls and towers, belonging to the Greek, Roman, and Byzantine eras. Near the western extremity of the town are also some massive structures, which overlook the swamp or marsh where was the ancient harbour. These are regarded with much probability as the site of the famous *Temple of Diana*. This marvellous building, one of the seven wonders of the world, was originally built by Chersiphron; but after its destruction by Herostratus on the night (as is said) when Alexander the Great was born (356 B. C.), it was rebuilt by the inhabitants in a style of greater splendour than before, the very women contributing their ornaments to secure the necessary funds; yet, notwithstanding this enthusiasm, more than two hundred years elapsed before the new edifice was completely finished. It was the largest Greek temple ever constructed. Its length was 425 feet, its width 220, the number of its columns 128, of which 36 were carved, and their height 60 feet. It had an area more than four times that of the Parthenon at Athens, and even the Olympeium was only about two-thirds as great. But even more wonderful than the temple itself were the numberless statues and pictures which it contained, executed by the best masters of Greece. The altar of the goddess was principally adorned with the works of Praxiteles. Plundered of its treasures by Nero, and burned (as has been mentioned) by the Goths, it was most likely finally destroyed by the iconoclasts, in the reign of Theodosius I., who issued his celebrated edict against the ceremonies of the pagan religion 381 A.D. The site of E. is now occupied by some wretched villages, the principal of which is

Ayasaluk.—Certain cabalistic words or sayings are said to have been inscribed on the figure of Diana, which being copied and carried about as charms, became known as *Ephesæ litoræ* (Mason's *Anatomie of Sorcerie*, 1612).

E'PHOD, a vestment worn by the Jewish high-priest over the *Mĕïl* or second (purple) tunic. It consisted of two shoulder-pieces, one covering the back, the other the breast and upper part of the body, not unlike the Greek *epōmis*. Two onyx stones set in gold fastened it on the shoulders, and on each of the stones were engraved the names of six tribes, according to their order. The material of which the ephod was wrought was extremely costly and magnificent: 'gold, blue, purple, crimson, and fine twined linen.' A girdle or band, of one piece with the ephod, fastened it round the body. Just above this girdle, in the middle of the ephod, and joined to it by little gold chains, rings, and strings, rested the square oracular breast-plate with the mysterious *Urim and Thummim.* See also HIGH-PRIEST and URIM AND THUMMIM.

Originally intended to be worn by the high-priest exclusively, ephods of an inferior material seem to have been in common use in later times by the ordinary priests. Even David, when bringing the ark back to Jerusalem, appeared in one. There is also mention made of an ephod in several passages of the book of Judges and Samuel, where the word must needs stand either for the *whole* priestly apparatus of an illegal service, or simply for a statue or an idol. The Talmud understands this ephod to have been a colossal shoulder vestment of gold, to which divine honours were rendered.

E'PHORI (Gr. 'overseers'), an order of magistrates in ancient times which appears to have originated at Sparta, and to have been peculiar to the Doric governments. When or by whom the ephori were first instituted, is a point of great uncertainty. Herodotus attributes their creation to Lycurgus, and Aristotle to Theopompus (770—720 B.C.). Their duty was to superintend the internal administration of the state, especially affairs of justice, for which a particular building was assigned them, called the Ephorion. One of their most important functions was the oversight, at least in part, of the education of youth, for we are told by Athenæus that they inspected the clothing and bedding of the young men. The ephori were five in number; they were elected by and from the people —on which Aristotle observes, that through them the *demos* enjoyed a participation in the highest magistracy of the state—and held their office only for one year. Their influence gradually increased, for their powers were so ill defined that it was difficult to say what was *not* under their cognizance and authority. Cicero draws a comparison between the ephoralty of Sparta and the tribunate of Rome, which is not altogether unwarranted by the facts of the case. Ultimately, the kings themselves became subject to the supervision of the ephori. Cleomenes, for example, was brought before them for bribery; Agesilaus was fined, and Pausanius imprisoned; and in extreme cases they could prefer charges against them, and have them tried before the supreme criminal court. They also transacted the negotiations with foreign powers, subscribed treaties, raised troops, 'intrusted the army to the king or some other general,' and, in fact, acted as the executive of the state. Muller regards the ephoralty as 'the principle of change in the Spartan constitution, and, in the end, the cause of its dissolution.' In the hands of the ephori, the constitution of Sparta certainly ceased to be a genuine aristocracy, and became a sort of oligarchy; but this point is involved in much obscurity and perplexity. Their authority, however, was at last destroyed by Agis and Cleomenes, who murdered the ephori for the time being, and restored the old Spartan constitution (225 B.C.).

E'PHRAEM SY'RUS, one of the most celebrated and prolific ecclesiastical writers of the Syrian Church. Several accounts of his life have been handed down to us, but they all bear more or less such a legendary character, that the real facts to be gathered from them are but scanty. It appears, then, that Ephraem (Heb. *Ephraim*) was born in the early part of the reign of Constantine the Great, 'somewhere between the Euphrates and Tigris,' most probably at Nisibis. His parents were, according to some, heathens; and E., repudiating their idolatry at an early age, had to leave their roof. Jacob, Bishop of Nisibis, took care of the boy, and undertook his education. His progress in learning was so satisfactory that the bishop was soon able to make him teacher at his own school; and when in 325 A.D. Jacob went to the council of Nicæa, E. accompanied him thither. In 363, Nisibis was ceded by Jovinian to the Persians, and E. first retired into Roman territory, then went to Anid, his mother's birthplace, and finally settled in Edessa (Orfa), where he remained until his death. He is said to have been so poor when he first arrived at Edessa, that he was obliged to take service at a public bath, but he soon became acquainted with hermits of the neighbourhood, and adopted their habits: he retired into a cave near the town, and led the life of a recluse. But so great were his piety and asceticism, as well as his readiness to help the poor and tend the sick, that he was looked upon as a saint, and his day is still celebrated, at different dates, in various churches. Among his usual denominations, more especially referring to his teachings and writings, are 'Prophet of the Syrians, Column of the Church, Harp of the Holy Spirit,' &c.; and his name is never mentioned without the 'Mor' or 'Mari' (Lord, My Master) being prefixed. But for all that, he had no lack of enemies. His burning zeal for preaching and converting led him to attack most fiercely almost every one beyond the pale of his peculiar creed. He spoke and wrote unceasingly against Idolaters, 'Chaldees,' Jews, and heretics of all kinds, especially Arians, Sabellians, Manichæans, Novatians, &c. Towards the end of his life, he paid a visit to Basil the Great, in Cappadocian Cæsarea, who could not prevail upon him to accept of any higher office in the church than a deanery, though he spared no effort to make him bishop. Returned to Edessa, he found plague and famine raging there, and to his over-exertions for the relief of the sufferers his death is attributed by some. He expired in the same year with Basil, in 378, not before having given the strictest injunctions that his burial should be of the very simplest description. With respect to the Testament which he is reported to have dictated in his dying hour—much as it has been used for biographical purposes —we can take no notice whatever of it, as it is entirely spurious.

The visit to Basilius, unimportant as it seems, has been of very great moment. The legend which surrounds this, as all other incidents of his life, with a halo of miracle, records that the two men, although previously ignorant of each other's language, began to speak them fluently at this interview—Basilius Syriac, and E. Greek. This wonderful circumstance first induced the learned to enter upon the question, whether E., half of whose voluminous works are in Greek, did really understand that language; and further, whether he understood any language but his own, Syriac. If he did not, what view was to be taken of his Commentaries on the Bible, of which the Hebrew and Greek texts, as well as the Septuagint and the Greek Fathers, must have been a sealed book to him. There were, and are still, great differences of opinion on these points, but it is generally taken for granted now, that he did not understand any language but his own; that he made use of the common Syriac version, the Peshito; that his grammatical and linguistic notes are taken from different Syriac Commentaries, and that the Greek portion of his works consists partly of translations made from his Syriac after his death, or even during his lifetime, and partly of interpolations. Both the praise and the blame which have been indiscriminately bestowed upon him as a writer are exaggerated. His chief merit lies in the glowing fervour and the deep piety which he infused into all he wrote, more particularly into his elegiac hymns. Diction and form are poetical throughout, and when not soaring into the infinite, of no mean beauty. The effect is heightened by the matchless simplicity and awing grandeur of the Syriac idiom.

We will now enumerate his principal works and their editions. Those (under his name) in Greek, consist of Sermons or Homilies, and Treatises of an exegetic, dogmatic, and ascetic nature. Photius records that he wrote more than a thousand such sermons; Sozomenos speaks of '300 myriads;' but, as we said before, of those that have come down to us, some are spurious, and others at least suspicious. Gerhard Vossius translated 171 treatises from Greek MSS. found in Italian libraries, into Latin, and published them at Rome, 1589—1598, in 3 vols. (There is but one piece in them translated from the Syriac.) They were reprinted in Cologne in 1603, 1619 (1675), and also in Antwerp, in 1619. The first Greek edition appeared in Oxford in 1709, edited from 28 Oxford MSS., by E. Thwaites. The most important of his Syriac works are, besides an infinite variety of homilies, sermons, poems, &c., his commentaries, or rather scholia, on parts of the Old Testament. Their value to us, however, is limited to their aiding us in explaining and fixing some readings of the Peshito (see PESHITO), and in enriching our critical apparatus. That he also commented on the Gospels is certain, but no MS. has been found as yet, not even in a Greek or Arabic translation. As to the songs and prayers in the Syrian Liturgy ascribed to E., they are simply composed in his manner, and betray their comparatively recent origin at the first glance. The principal edition of his works in Syriac and Greek was published in 6 vols. in Rome, under the papal authority (1732—1746).

The principal writers on E. are: Sozomenos, *Hist. Eccl.* iii. 16; Assemani, *Proleg.* and *Biblioth. Orient.;* Credner, *De Proph. Min. Vers. Syr.* (1827); Lengerke, *Comm. de Ephr. Syr. S. S. Interprete* (Halle, 1828); and *De Ephr. Syr. Arte Hermen.*, &c. (1831). Some tasteful German translations of hymns, by Zingerle, are to be found in the *Zeitschr. d. Deutschen Morgenl. Gesellsch. passim.*

E'PHRÄIM, the younger son of Joseph by his wife Asenath, and the founder of one of the twelve tribes of Israel. It is possible that he may have received his name, which signifies 'double fruitfulness,' from having been born during the seven years of plenty. His grandfather, Jacob, shortly before his death, prophesied the greatness of his posterity when giving him his blessing: 'His seed shall become a multitude of nations' (Gen. xlviii. 19). After the Israelites had left Egypt, the tribe of Ephraim numbered 40,500 (Numbers, i. 32, 33); but from causes not specified, and not discoverable, it had sunk, forty years later, on the eve of the conquest of Canaan, to 32,500 (Numbers, xxvi. 37). Yet it was under the leadership of an Ephraimite, Joshua, the son of Nun, that the Canaanites were subjugated, and the land possessed. This seems to have given the tribe a much higher influence than might have been expected from its numerical strength. We find Judah and Ephraim classed together as taking their inheritance first (Josh. xv. xvi., &c.). The precise boundaries of Ephraim, as of the other tribes, it is impossible to determine. It occupied the centre of Palestine, was bounded on the south by Dan and Benjamin, and stretched from the Jordan on the east to the Mediterranean on the west. From scattered notices of the Ephraimites in the earlier annals of the Hebrews, we infer that they were, on the whole, jealous of their brethren. This feeling of dissatisfaction at length broke out into rebellion in the reign of Rehoboam, and the new kingdom of Israel, ruled over by Jeroboam, was for the most part merely the kingdom of Ephraim, for the land which lay to the north of it could hardly be said to be actually in the possession of the tribes whose names it bore, the original inhabitants keeping stubborn hold of their cities and strongholds. See ISRAEL, KINGDOM OF.

EPI, or **GIROUETTE** (Fr.), a species of ornamental ironwork with which the cones of pavilions or pointed roofs are sometimes surmounted in the renaissance style of architecture. One of the finest examples is that which surmounts the Tourelle aux Pastorals at the Hôtel de Bourgtheroulde in Rouen.

EPIC POETRY (Gr. *epos*, a word, a discourse or narrative). The two chief kinds of poetry, are Epic poetry and Lyric poetry. Epic poetry has outward objects for its subject, of which it gives an imaginative narrative. The events themselves may be partly real and partly fictitious, or they may be altogether fictitious. Lyric poetry, on the other hand, sets forth the inward occurrences of the writer or speaker's own mind—his feelings and reflections. No composition, perhaps, answers, in all its parts, to the one of these descriptions, or to the other; but a piece or poem is classed as epic or lyric according to the element that predominates. Under each of these grand divisions, or genera, there are subdivisions, or species. The longer poems of the epic genus embrace an extensive series of events, and the actions of numerous personages. The term *heroic* epic, or *heroic* poem, is properly applied to such works as the *Iliad* and *Odyssey* of Homer, Virgil's *Æneid*, Tasso's *Jerusalem Delivered*, Ariosto's *Orlando Furioso*, and others, which describe the achievements of the gods and heroes of antiquity, or of the little less mythic knights of medieval chivalry. Poems, again, like Milton's *Paradise Lost* and Dante's *Divina Commedia*, are *sacred* epics. Byron's *Childe Harold*, with the length and narrative structure of an epic, abounds in reflection, sentiment, and satire, and thus is, in substance, as much lyric as epic. Productions like those now named form the class of grand epics, or epic poems, by way of eminence. But there are several species of minor poems which, from their nature, must also be ranked as epics. One of these is the *Idyl*, a term applied to what is called *pastoral poetry*, or to descriptions in general of natural scenery, and of the actions and manners of men in calm, ordinary life. Burns's *Cotter's Saturday Night*, Goldsmith's *Deserted Village*, and most of Crabbe's poems, are idyls; so are poetical epistles.

The *ballad* (q. v.) is another species of minor epic.

Attempts at epic poetry are now rare, the spirit of the age being against that form of composition. Instead of epic poems, we have *novels*, which, so far as subject is concerned, may be considered as the epics of modern civil and domestic life.

EPICHA'RMUS, a famous Greek poet, was born in the island of Cos, in the 5th c., B.C. At first, he studied philosophy under Pythagoras; but a residence at Megara, the native soil of comedy, gave him a taste for that branch of the drama. After the destruction of Megara, in 484 B.C., he removed to Syracuse, where, at the court of Hiero, he spent the remainder of his life. From this circumstance, he is often mentioned by the ancients as a Sicilian. Almost nothing else is known of his personal history except that he died at the age of 90, or, as some say, of 97. The date of his death, as of his birth, is unknown. E. is called by Theocritus the father of comedy, and Plato assigns to him a place among comic writers as high as that of Homer among epic poets. He certainly did a good service in excluding, to a large extent, from his dramas the vulgar buffoonery which disgraced all previous comedies, and in introducing a regular plot in which the *comus* or band of revellers sustained the dialogue. None of E.'s works survive entire; but we possess several fragments and the titles of thirty-five. They embraced a wide variety of topics, mythological, social, and political. From one of them, Plautus borrowed the plot of his *Menæchmi*, which shews a great amount of constructive skill. The fragments of E. have been collected and edited by H. P. Krurmann (Harlem, 1834). Compare Grysar, *De Doriensium Comœdia* (Colon. 1828), and Muller's *Dorians*.

EPICTE'TUS, a celebrated disciple of the Stoa, was born at Hierapolis, in Phrygia, about fifty years after the birth of Christ. He was at first the slave of Epaphroditus, a freedman of Nero, at Rome, whose abusive treatment he is said to have endured with the composure characteristic of the sect to which he belonged. He was afterwards manumitted, and devoted himself to the Stoic philosophy. Domitian hated him on account of his principles, and banished him, along with several other philosophers, from Rome. E. settled at Nikopolis, in Epirus. Under the pressure of the times in which he lived, his serious moral views received a character rather of self-denial than of energy; to renounce, to endure, and not to set the mind upon anything beyond the power of the individual to attain, being the points chiefly insisted on. His pupil, Arrianus, collected the maxims of E. in the work entitled *Encheiridion* ('Handbook') and in eight books of Commentaries, four of which are lost. The peculiar excellence of the writings of E. consists in their simple and noble earnestness. That real heartfelt love of good and hatred of evil which we are in the habit of supposing an exclusively Christian feeling, does manifest itself very finely and beautifully in these, yet, as Professor Brandis says, 'there is not a trace in the *Epictetea* to shew that he was acquainted with Christianity, and still less that he had adopted Christianity, either in part or entirely.' Some of his opinions, moreover, are essentially Christian in their nature, though, of course, they are unconnected with the facts of revelation. E. believes in our 'resemblance' to God, in our 'relationship' to him, and in our 'union' with him through the coincidence of the 'will' and the 'soul;' he recognises the contest between good and evil, the life-struggle in the heart, the divine life against which the law in the members wars; and he affirms the necessity of 'invoking God's assistance in the strife,' that the inner life may become pure as God is pure. There are several good editions of the works of E., the most complete of which is that of Schweighaüser (Leip. 1800).

EPICU'RUS, AND EPICURE'ANISM. Epicurus, an illustrious Greek philosopher, was born in the island of Samos, 341 B.C., seven years after the death of Plato. His father, Neocles, is said to have been a schoolmaster, and his mother, Chœrestrate, to have practised arts of magic. At the age of 18, he repaired to Athens, where it has been supposed that he may have had for his teacher Xenocrates or Theophrastus, or perhaps both, but he himself used to declare that he was self-taught. Of the older philosophers, he was most attached to Anaxagoras and Democritus, his system of physics being evidently built upon the atomic speculations of the latter. E.'s stay at Athens on this occasion was short. At Mitylene, in his thirty-second year, he first opened a school; and there and at Lampsacus he taught for five years. In 306 B.C., he returned to Athens, and established a school of philosophy in a garden which he purchased and laid out for the purpose. From this circumstance, his followers were called the 'philosophers of the garden.' Although E. laid down the doctrine, that *pleasure* is the chief good, the life that he and his friends led was one of the greatest temperance and simplicity. They were content, we are told, with a small cup of light wine, and all the rest of their drink was water; and an inscription over the gate promised to those who might wish to enter no better fare than barley-cakes and water. The chastity of E. was so incontestable, that Chrysippus, one of his principal opponents, in order to deprive him of all merit on the score of it, ascribed it to his being without passions. The calumnies which the Stoics circulated concerning him are undeserving of notice, and were at no time generally believed. E.'s success as a teacher was signal; great numbers flocked to his school from all parts of Greece, and from Asia Minor, most of whom became warmly attached to their master, as well as to his doctrines, for E. seems to have been characterised not less by amiability and benevolence than by force of intellect. He died 270 B.C., in the seventy-second year of his age.

E. was a most voluminous writer. According to Diogenes Laertius, he left 300 volumes. Among others, he had 37 books on Natural Philosophy, a treatise on Atoms and the Vacuum; one on Love; one on Choice and Avoidance; another on the Chief Good; four essays on Lives; one on Sight; one on Touch; another on Images; another on Justice and the other Virtues, &c. Almost all these works are lost: the only writings of E. that have come down to us are three letters, and a number of detached sentences or sayings, preserved by Diogenes Laertius, in his life of the philosopher. The principal sources of our knowledge of the doctrines of E., besides the above letters, &c., are Cicero, Seneca, and, above all, Lucretius, whose great poem, *De Rerum Natura*, contains substantially the Epicurean philosophy.

Although the majority of E.'s writings referred to *natural* philosophy, yet he was not a *physicist*, properly speaking. He studied nature with a *moral* rather than with a *scientific* design. According to him, the great evil that afflicted men—the incubus on human happiness—was FEAR; fear of the gods and fear of death. To get rid of these two fears, was the ultimate aim of all his speculations on nature.

The following is a brief account of his views. E.

regarded the universe (*Tó Pān*) as corporeal, and as infinite in extent, and eternal in duration. He recognised two kinds of existence—that of bodies, and that of *vacuum*, or space, or the intangible nature. Of his bodies, some are compounds, and some atoms or indivisible elements, out of which the compounds are formed. The world, as we now see it, is produced by the collision and whirling together of these atoms. He also held the doctrine of perception by *images* (Gr. *eidōla*), which are incessantly streaming off from the surface of all bodies, and which are necessary to bring us into *rapport* with the world without. In like manner, he believed that sounding bodies threw off emanations, by which we are brought into sympathy with them; and that perception by smell took place in the same way. In psychology, E. was a decided materialist, holding, for various reasons, that the soul is a bodily substance, composed of subtile particles, disseminated through the whole frame, and having a great resemblance to spirit or breath with a mixture of heat.

In seeking to understand the phenomena of the heavens, E. has no scientific end in view; his sole object is to enable the mind to account for them to itself, without the necessity of imagining any supernatural agency at work. 'The phenomena of the heavens,' says E., 'admit of various causes being assigned for their production, equally conformable to the facts learned from the senses. If, then, in thinking of any appearance, we suppose it brought about by the same cause that produces another appearance which gives no alarm or uneasiness, we are as much delivered from uneasiness as if we *saw* that such is the cause of it. E. did not deny that there are gods, but he strenuously maintained, that as 'happy and imperishable beings,' they could have nothing to do with the affairs of the universe or of men. 'Beware,' he says, 'of attributing the revolutions of the heaven, and eclipses, and the rising and setting of stars, either to the original contrivance or continued regulation of such a being. For business, and cares, and anger, and benevolence, are not accordant with happiness, but arise from weakness, and fear, and dependence on others.'

E. next proceeds to deal with the fear of death. Having proved in his psychology that the dissolution of the body involves that of the soul, he argues that the most terrible of all evils, death, is nothing to us, 'since *when we are, death is not; and when death is, we are not.* It is nothing, then, to the dead or the living; for to the one class it is not near, and the other class are no longer in existence.' Whether E. actually succeeded in removing the terrors of death by his syllogism, may be doubted.

The *positive* part of E.'s system may be noticed in a few words. He held that *pleasure* was the chief good, and it is from a misapprehension of the meaning of this word as used by E. that the term Epicurean came to signify one who indulged his sensual appetites without stint or measure. At the same time, it is easy to see that the use of the word 'pleasure' was calculated to produce the mischievous results with which the later Epicureanism was charged. According to E., the sources and tests of all ethical truth are the feelings (*pathe*), and these are two, pleasure and pain. We delight in the one, and avoid the other instinctively. 'When we say that pleasure is the end of life, we do not mean the pleasures of the debauchee or the sensualist, as some from ignorance or from malignity represent, but freedom of the body from pain, and of the soul from anxiety. For it is not continuous drinkings and revellings, nor the society of women, nor rare viands, and other luxuries of the table, that constitute a pleasant life, but sober contemplation that searches out the grounds of choice and avoidance, and banishes those chimeras that harass the mind.' But, on the other hand, E. says: 'If the means to which sensualists owe their pleasures dispelled the anxieties of the mind . . . . and enabled them to set limits to their desires, we should have no grounds to blame them for taking their fill of pleasure, wherever they could find it, provided it were attended with no pain or grief from any quarter; for that is the only evil.' The whole question of ethics, then, comes to a calculation and balancing of pleasures and pains; in other words, the cardinal virtue is *prudence*. E. rests *justice* on the same prudential basis as temperance. Denying any abstract and eternal right and wrong, he affirms that injustice is an evil, because it exposes the individual to disquietude from other men; justice is a virtue, because it secures him from this disquietude. 'Injustice is not an evil in itself, but becomes so from the fear that haunts the injurer of not being able to escape the appointed avengers of such acts.' The duties of friendship and good-fellowship are inculcated on the same grounds of security to the individual.

Among the Romans, the system of E. was adopted by many distinguished men. Horace, Atticus, and Pliny the Younger, were Epicureans; and the splendid poem of Lucretius must have recommended the system to many. In modern times, Epicureanism was resuscitated in France by Pierre Gassendi, who published an account of E.'s life and a defence of his character in 1647. Many eminent Frenchmen have professed his principles; among others, Molière, Saint Evremont, Count de Grammont, the Duke of Rochefoucault, Rousseau, Fontenelle, and Voltaire.

EPICY'CLE. The earlier astronomers assumed that all the motions of heavenly bodies took place in circles, the circle being held to be the most *perfect* of all curves; and a necessary consequence of this assumption was, that the motions must have a uniform velocity. Another part of the hypothesis was, that all the heavenly bodies moved round the earth, which remained at rest in the centre. The observed phenomena of the heavens, however, were soon seen to stand in glaring inconsistency with these assumptions; and to remedy this, it was necessary to have recourse to additional assumptions. For the sun and moon, which manifestly do not always move with the same velocity, the *Eccentric Circle* (q. v.) was imagined. The case of the planets, whose motions were seen to be sometimes direct, sometimes retrograde, and sometimes altogether arrested, offered still greater difficulties; to get over which, the idea of *epicycles* was hit upon. According to this hypothesis, while a planet was moving in a small circle, the centre of that small circle was describing a larger circle about the earth. This larger circle was called the *deferent*, and the smaller, which was borne upon it, was called the *epicycle* (Gr. *epi*, upon). In this way the motions of the planets about the earth were conceived to be something like what the motion of the moon about the sun actually is. By assuming proper proportions between the radii of the deferent circle and the epicycle, and between the velocities of the two motions, it was found possible to account pretty satisfactorily for the above-mentioned appearances and irregularities in the motions of the planets. But it is only the irregularities arising from the revolution of the earth about the sun that can be at all explained in this way, and not those arising from the elliptic motions of the planets about the sun, nor yet the inequalities of the moon's motions. The successors of the Greek astronomers, down to Tycho Brahé, continued, therefore, to increase the number of epicycles, setting one circle upon another, until the hypothesis, in itself complicated, became still more so, and made the simplicity of the Copernican system at once striking.

EPICY'CLOID is the name of a peculiar curve. When a circle moves upon a straight line, any point in its circumference describes a Cycloid (q. v.); but if the circle moves on the convex circumference of another circle, every point in the plane of the first circle describes an epicycloid; and if on the concave circumference, a hypocycloid. The circle that moves is the generating circle; the other, the base. The describing point is not necessarily in the circumference of the generating circle, but may be anywhere in a radius or its prolongation. This curve was first investigated by the Danish astronomer Römer. It has many remarkable properties, and is even useful in the practical arts. The teeth of wheels in machinery must have an epicycloidal form, in order to secure uniformity of movement.

EPIDA'MNUS. See Durazzo.

EPIDAU'RUS, a town of ancient Greece, on the eastern shore of the Peloponnesus, in the district of Argolis, was situated on a small promontory, 15 stadia in circumference, in the Saronic Gulf, in lat. 37° 38′ N., long. 23° 10′ E. During the most prosperous period of Grecian history, E. was an independent state. It was colonised first, it is supposed, by Carians (hence the older name of *Epicarus*, according to Aristotle), and afterwards by Ionians, but was subsequently invaded by a Dorian army under Deiphontes, the son-in-law of Temenus the Heracleide. This force dethroned Pityreus, the Ionian king of E., compelled him and his citizens to retire to Athens, and inaugurated the Dorian rule, which preserved the ascendency at E. during the whole of the historical period. The form of government was originally monarchical, but after many vicissitudes, it eventually became and remained oligarchical. At an early period, E. became one of the chief commercial cities of the Peloponnesus. It colonised the islands of Cos, Calydnus, and Nisyrus, as well as the town of Ægina, which, during the 6th c., attracted all its commerce from the then declining mother-city. E. was chiefly famous for its temple of Æsculapius, to which patients resorted from all parts of the Hellenic world, seeking cures for their diseases. The site of this temple was a plain surrounded by mountains, about 5 miles west of the town, and which is still called Hieron, the sanctuary. E. had also numerous temples, among which were those of Artemis, Dionysus, Aphrodite, and Hera, and a magnificent theatre, at present in a more perfect state of preservation than any in the Peloponnesus, and with sufficient accommodation for 12,000 spectators.

E. (modern Greek, *Epidavro*) is now a small village, with scarcely 100 inhabitants, employed for the most part in raising vegetables for the Athenian market. The plain surrounding the village is productive and highly cultivated. Here, in January 1822, a congress from all parts of Greece assembled, and promulgated the constitution, known as the constitution of Epidaurus.

EPIDE'MIC (Gr. *epi*, upon, and *dēmos*, the people), a disease which attacks numbers of persons in one place simultaneously or in succession, and which in addition is observed to travel from place to place, often in the direction of the most frequented lines of communication. Many epidemic diseases are also contagious, and all of them suggest the necessity of careful inquiry into the ventilation, drainage, food, drink, and habits of the persons liable to be affected. In presence of an epidemic, it is proper to take unusual precautions to preserve the public health (see Health, Public), and not unfrequently the organisation of a regular house-to-house visitation of the locality is calculated to do much good, by directing the minds of the poor and ignorant to their duties in respect to themselves and to each other. See Endemic for further observations on this subject; also Contagion, Infection, Fever, Cholera, &c.

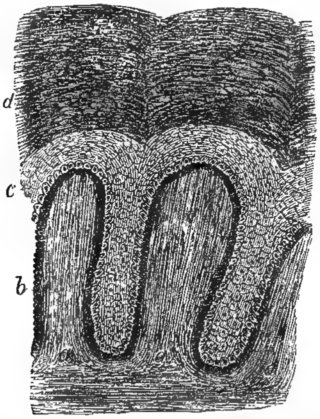
EPIDEMIC MENTAL DISEASES. When we consider how ordinary and normal thoughts and emotions spread from one man to many, and sway multitudes to the same views and actions, it is no longer a mystery that morbid conditions of the mind should become at times no less epidemic than physical diseases. Such, at least, is the fact. A mental disorder may spread from man to man, and may involve whole nations. It depends for its propagation, like an epidemic disease, first upon external circumstances, and secondly, upon the peculiar condition or constitution of the individuals affected. Like the bodily affection, the causes which provoke the insanity and the tendency to be affected may have been in process of development for years. Both attack the weak rather than the strong; both exist for a season, and disappear. In the case of the mental malady, the external influences—those which constitute the moral atmosphere—are ignorance or imperfect knowledge, the power of one mind over another, the influence of language, the diffusion of particular opinions, the tendency to imitate. It is probable, however, that physical causes exercise an important influence in the production of such general mental conditions. In 1842 and 1844, there occurred in Germany and France, among the military, epidemics of meningitis with delirium, or inflammation of the membranes of the brain, when no moral factors were at work, but when diet, temperature, &c. were. But even where the origin cannot be so distinctly traced, the co-operation of external as well as psychical agents may be legitimately predicated. It would accordingly be illogical to limit the production of the Dancing Mania (q. v.), which occasionally, during several centuries, swept over Europe, to the reaction succeeding the dread of the end of the world, which had previously prevailed epidemically. An examination of about a hundred manifestations such as that alluded to, collected from various sources, demonstrates that not merely the intoxication of joy, but the most absurd forms of belief—that dreams, delusions, superstitions, corruptions of language, all instincts and passions, even movements and cries, may assume the form, and, to a certain extent, may follow the laws of epidemic diseases. In far-distant ages, there are records of a histrionic plague, when, after a summer of intense heat, all conceived themselves players, and traversed the streets, and sunk and died, repeating verses, and exhibiting extravagant gesticulations; of whole communities being stricken with nightmare, which was so general as to be supposed and called contagious. There have been epidemics of homicidal and suicidal mania. In one age, hundreds are found possessed by Satan; in another, larger numbers converted into wolves; and in recent times, the leaping ague of Forfarshire, and outbursts of pyromania in various places, remind us that there may be still in the constitution of the human mind, and in the education and the habits of life prevailing, elements capable of realising the catastrophe suggested by Bishop Butler's question: What is to prevent a whole nation becoming mad? The instances of epidemic mental disease recorded in the following table, have been selected from a vast number of others, with a view of shewing not the frequency or extent of such affection, but the range of the phenomenon through the powers and propensities of our nature.

Popular Name.	Form of Disease.	Year.	Number Affected.	Authority.
St Vitus's—St John's Dance,	Choreamania	1374	Hundreds	Hecker
Wolf-madness, . . .	Lycanthropia	1523	〃	Calmiel
Possession, ...	Demonomania	1642, &c.	〃	〃
Convulsionaries of St Medard,	Theomania	1731	〃	〃
Incendiarism, . .	Pyromania	1800	Many	Marc
Witchcraft, ...	Demonopathia	Various	Thousands	Various
Suicide, ...	Melancholia	〃	〃	Esquirol
Visions, . . .	Delusions	〃	Many	Brierede Boismont
Timoria, Panic, . .	Panphobia	1845	Many	*Edin. Review* 1849

There appears to be no guarantee that the present and future generations shall be exempted from similar visitations, except in the universal diffusion of knowledge and sound thinking, for it is invariably in the darkness of ignorance or in the twilight of imperfect knowledge that the moral plague comes.—Hecker's *Epidemics of the Middle Ages;* Calmiel, *De la Folie considerée sous le Point de Vue Pathologique, Philosophique, Historique et Judiciaire, depuis la Renaissance des Sciences en Europe jusq'au dix-neuvième Siècle*, &c.; and *Psychological Journal, passim.*

EPIDE'RMIS (Gr. *epi*, upon, and *derma*, the skin), a semi-transparent membrane, containing neither vessels nor nerves, and everywhere forming an external covering to the corium or true skin. See SKIN. The epidermis is called in ordinary language the *scarf-skin.* It consists of two layers, chemically and morphologically distinct—viz., the *mucous layer*, which lies immediately upon the corium, and the *horny layer*, which forms the outermost surface of the body.

The *mucous layer* (known formerly as the *rete mucosum s. Malpighianum*) is of a whitish or slightly brown tint (in the Negro, dark gray or black), and is composed of small soft cells. The innermost of these cells, resting on the surface of the corium, are elongated and arranged perpendicularly; upon these follow elongated or roundish cells in many layers, which, in proportion to their distance from the corium, acquire, from their mutual pressure, a polygonal form, which may even be recognised in individual cells.



Perpendicular Section of the Skin of the Leg of a Negro: Magnified 250 diameters.

a, a, papillæ of the cutis; *b*, deepest intensely coloured layer of perpendicularly elongated cells of the mucous layer; *c*, upper stratum of the same layer; *d*, horny layer.

All the cells in the mucous layer are nucleated vesicles distended with fluid, and likewise containing minute granules, which diminish in number in the more external cells.

The *horny layer* forms the external semi-transparent part of the epidermis, which in the white races is colourless, and is composed almost wholly of uniform cells, metamorphosed into plates or scales. The deepest plates in some degree resemble the uppermost cells of the mucous layer; but in the second or third layer we find the flattening commence; till at length, after a gradual series of modifications, we have the hard, horny scales which occur on the surface, where they are regularly cast off with more or less rapidity, and replaced by those beneath them.*

The colour of the epidermis differs in different persons and in different parts of the body. It is deepest around the nipple, especially in women during pregnancy and after they have borne children. A more or less dark pigment is often deposited, in persons who are exposed to the sun, in the face, neck, back of the hands, &c. These tints are not produced by special pigment-cells, but are seated in the common cells of the mucous layer, round whose nuclei granular pigment is deposited. In the Negro and the other coloured races, it is also only the epidermis which is coloured, while the *corium* completely resembles that of Europeans. The perpendicular cells (see *b* in the figure) are the darkest, and form a sharply marked fringe at the edge of the clear corium. To these succeed brown cells, which accumulate in the depressions between the papillæ, and as we approach the horny layer, we have yellowish cells. The horny layer of the Negro also inclines to a yellow or brownish tint.

Morbid coloration of the epidermis (freckles, mother's marks, &c.) is produced in the same way as the colour of the Negro's skin. Numerous instances of partially or entirely white Negroes and of black Europeans, not as a consequence of change of climate but as an abnormal condition of the skin, are on record.

The thickness of the epidermis varies extremely. While upon the cheeks, brow, and eyelids, it varies from $\frac{1}{75}$th to $\frac{1}{60}$th of a line, on the palm of the hand it ranges from $\frac{1}{3}$d to $\frac{1}{2}$ a line, and on the sole of the foot sometimes even exceeds a line. In some parts of the body the horny layer is thicker than the mucous; in other, the mucous is the thicker of the two. As the chief use of the epidermis is that of affording protection to the soft and tender subjacent parts, it attains its greatest thickness on those portions of the body (the palm of the hand and the sole of the foot) which are most exposed to pressure and friction.

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* In reptiles and amphibians, this layer is periodically cast off in a more or less entire state, a new one being previously formed beneath it; and in man, desquamation in large patches often occurs after certain diseases, especially scarlatina.

In *plants*, as in animals, the epidermis is formed of flattened cells, of which also new layers are continually produced from the bark below, whilst the outer ones dry up, lose their vitality, and peel off, crack and split off, or otherwise become separated from the living organism. The cells of the epidermis are often enlarged outwards, so as to form projections, sometimes very slight, sometimes elongated into Hairs (q. v.). Glands (q. v.) are also connected with the epidermis, sometimes by the intervention of hairs, sometimes without, and in this way it contributes to the secretion of substances formed in plants by the wonderful chemistry of nature, and on which their value to man often greatly depends. The cells of the epidermis are usually filled with a colourless fluid, but resinous and waxy substances are sometimes found in them, and sometimes silica (as in grasses and Equisetaceæ), sometimes carbonate of lime (as in the *Charas*). The epidermis is pierced by *Stomata* (q. v.). When the epidermis of plants is subjected to prolonged maceration, it can often be made to separate into two parts; one, which is more strictly called the epidermis, being the inner, lower, and thicker membrane; the other, which is called the *Pellicle* or *Cuticle*, being very thin, and extending continuously over every part of the plant except where it is pierced by the stomata. Thus, this superficial pellicle invests even the finest hairs. In some of the *Algæ*, it seems to constitute the whole integument. In the greater number of plants, the epidermis is thin and soft, but sometimes it is thick, and sometimes hard.

E'PIDOTE, a mineral allied to garnet, composed of silica and alumina, with a considerable proportion of lime, or of peroxide of iron, or of peroxide of manganese. These diversities of composition constitute three very distinct varieties; and of these there are sub-varieties, differing in colour and other particulars (*Pistacite*, *Bucklandite*, *Withamite*, *Zoisite*, &c.). E. is sometimes found massive, foliated, columnar, granular, or incrusting; often crystallised. Its crystals are prisms, variously modified. Its prevalent colours are green, yellow, and gray, but some of the varieties are red and black. It is found in gneiss, syenite, trap, and other rocks in a number of localities in Scotland, and in many parts of the world.

EPIGA'STRIUM (Gr. *epi*, over, and *gastēr*, the stomach), the part of the Abdomen (q. v.) which chiefly corresponds to the situation of the stomach, extending from the Sternum (q. v.) towards the Navel or Umbilicus (q. v.), and bounded on each side by the Hypochonders (q. v.). It is called in popular language the pit of the stomach.

EPIGE'NESIS (Gr. *epi*, upon, and *genesis*, a formation), a formation upon, or in addition to, previously existing parts. The word is applied in physiology to that theory of new formations in organised beings which supposes them to spring from superadded centres of vital activity, as opposed to the theory which presumes that the new is formed by a development or modification of the old structure. See Ovum.

EPIGLO'TTIS. See Larynx.

E'PIGRAM, a word derived from the Greek, and literally signifying an 'inscription.' In point of fact, the epigrams of the Greeks were simply inscriptions on tombs, statues, and monuments, written in verse, and marked by great simplicity of style, but having nothing in common with what now passes under the name. It was among the Romans that the epigram first assumed a satirical character. Catullus and Martial are reckoned the best Latin epigrammatists. In modern times, an epigram is understood to be a very short poem, generally from two to eight lines, containing a witty or ingenious thought expressed in pointed phraseology, and in general reserving the essence of the wit to the close, as the serpent is fabled to keep its sting in its tail. The French excel all other nations in this kind of poetry. Their earliest epigrammatist of any note was Clement Marot (1495—1544); their best are Boileau, Voltaire, and Piron. The epigrams of German writers are for the most part happily expressed moral proverbs, but the *Xenien* of Schiller and Goethe contain not a few sharp and biting verses of a satirical character. In Britain, Pope, Burns, Byron, Moore, and other writers have shewn a remarkable power of epigrammatic satire.

E'PIGRAPH (Gr. *epi*, upon, and *grapho*, I write), a terse inscription placed upon architectural or other monuments, for the purpose of denoting their use or appropriation, and very frequently worked in and forming part of their ornamental details.

E'PILEPSY (Gr. *epi*, upon, and *lambanō*, future, *lēpsō*, I seize), a form of disease characterised by sudden insensibility, with convulsive movements of the voluntary muscles, and occasionally arrest of the breathing, owing to spasm of the muscles of respiration, and temporary closure of the Glottis (q. v.). Epilepsy was called by the ancient Greeks the 'sacred disease.' Owing to the mysterious and extraordinary character of the convulsion of epilepsy, it was always, in ancient times, supposed to be due in a very special manner to the influence of the gods, or of evil spirits; Hippocrates, however, combats this idea in a special treatise, in which he maintains that epilepsy is no more and no less divine than all other diseases. The same idea of the specially supernatural character of epilepsy is shewn forth in the deeply rooted oriental notion of demoniac possession. See Demoniacs. Epilepsy is often called, in modern language, the 'falling sickness,' and this name is not only descriptive of one of its most striking phenomena, but also points distinctly to the most obvious danger of the fit. The patient is seized, without reference to his condition or occupation at the moment, with insensibility, often so complete and sudden as to lead to serious accidents and bodily injuries; in the most aggravated cases, he has no premonitory sensations whatever, but falls down without any attempt to save himself, and usually with a wild inarticulate cry of some kind, immediately after which the face is violently distorted, the head drawn towards one or other shoulder, and the whole body convulsed. These convulsions follow in rapid succession for a few minutes, and are attended by foaming at the mouth, and by great lividity, or, in some cases, livid pallor, which, with the irregular spasmodic movements of the lips, nostrils, and eyes, give a frightfully ghastly expression to the countenance, and almost invariably lead the bystanders to an exaggerated idea of the immediate danger of the fit. The immediate danger is, in reality, not great, excepting that the sudden attack may lead to an injurious or fatal fall; the tongue, however, may be bitten if protruded during the convulsion, or the patient may be so placed as to injure himself seriously by the repeated and unconscious movements of his body, or he may suffocate himself by accidentally falling with his face in water, or otherwise closing up the mouth and nostrils, or by dragging upon a tightened neckcloth. Care should be always taken to avoid these accidents by keeping the epileptic as much as possible within view of persons acquainted with his condition, and able to give such assistance as may be required; as well as by warning the patient himself to avoid all places in which a fall would be especially dangerous. But when an unskilled person happens to witness a fit of epilepsy, he will do well to remember that beyond the simplest and most obvious precautions against the dangers mentioned above, there is literally nothing to be done; and any attempt to rouse the patient by violent stimuli, as ammonia applied to the nostrils, or by dashing water in the face, or, still more, by administering medicines hastily recommended by the ignorant and thoughtless, is almost certain to do more harm than good. The tongue should be looked to, a piece of cork or other gag being, if necessary, inserted between the teeth; the patient should be then placed on a mattress or other soft place near the ground; his neckcloth should be removed, and the dress loosened round the chest; the head should be, if possible, a little raised, and a free circulation of air maintained (this last precaution being very apt to be neglected in case of a crowd); with these things done, it may be safely affirmed that in the vast majority of epileptic cases nothing has been left undone which will conduce to recovery. The ordinary course of the fit (which usually lasts from five to twenty minutes altogether) is as follows: the convulsions gradually diminish in intensity, and the patient passes into a state of deep but motionless stupor, with dilated pupils, and sometimes, but not always, with snoring or noisy breathing; the foaming at the mouth ceases, the colour gradually returns, and this state leads to recovery through a more or less protracted, but apparently natural sleep, the patient, on awaking, being often quite unconscious that he has been the subject of any anxiety, or, indeed, in any unusual condition whatever. Although in all cases of true epilepsy there is a stage of complete Coma (q. v.), or unconsciousness, yet the fit is often very transient, and but little attended by convulsion, being also less sudden than above described, and not necessarily causing a fall to the ground; in some cases, also, fits of greater intensity are preceded by certain premonitory symptoms or peculiar sensations, which act as warnings to the patient himself, and lead him to place himself in a position of safety on the approach of the paroxysm. Having in view these distinctions (which are certainly of considerable practical importance), the French language, both popular and scientific, has adopted the terms of *grand mal* and *petit mal* (i. e., great and little evil), as characterising the more and less dangerous forms of epilepsy respectively. The sensations which precede the fit in some epileptics have been termed in Latin the *aura* (i.e., breath) *epileptica*, from their supposed resemblance to a current of cold air passing over the body, and proceeding from the extremities towards the head. This description does not, however, hold good in all cases; and not unfrequently, as mentioned above, there is no *aura*, or unusual sensation of any kind, preceding the fit. It must be mentioned, however, as bearing on treatment, and as being quite within the bounds of popular medicine, that some of the most ancient authorities assert strongly the power of a tight bandage, placed suddenly upon the limb in which the aura begins, to cut short, or even to prevent altogether, the fit of epilepsy. Although this alleged fact has often been regarded as doubtful, it has never been altogether discredited, and has of late years been brought into renewed notice by good observers. It is even maintained that such a bandage, placed experimentally upon one or other of the limbs, and tightened on the approach of a fit, has been found effective in some cases in which there was no distinctly local sensation; and epileptics have been repeatedly convinced of the propriety of habitually wearing a bandage loosely applied upon the arm, which they have been able, by carefully watching their own sensations, and by being watched in turn by others, to get tightened at the proper time. There is no doubt room for fallacy in these observations, but they may safely be commended to notice, as involving no possible risk of mischief, and as far more worthy of extended trial than the great majority of popular remedies in epilepsy.

But the fit and its treatment form only a part of the anxieties which arise out of a case of epilepsy. The ultimate danger of the disease has little relation to the severity of the individual fits, except in the modified sense explained above; the frequency of the attacks being apparently much more apt to influence the duration of life than their character. Indeed, although epileptics may survive several severe paroxysms at distant intervals, and recover in the end with an apparently unbroken constitution, it rarely happens that very frequently repeated attacks, even of the *petit mal*, are unattended by some permanent depreciation of the powers of mind or of body. The most frequent, perhaps, of all the more serious consequences of confirmed epilepsy is Insanity (q. v.), sometimes assuming the form of acute mania or monomania following the attacks, but quite as frequently tending to gradual imbecility without any acute seizure. Sometimes the development of the epileptic insanity, or dementia, is attended by palsy, and other indications of structural disorder of the brain; in other instances, no such consequences occur, and the brain after death may be found to have very little tangible disease, or only such disease as is found in numerous other cases of functional derangement. Very often, even when the mind remains tolerably entire, there is loss of memory, and a certain want of acuteness and depression of spirits, which unfit the individual for the regular business of life. Disorders of the digestion are also not uncommon; and there is frequently a want of tone and vigour in all the bodily functions, which communicates a habitual expression of languor and reserve to the epileptic. Added to this, it can hardly be matter of surprise that the knowledge of his infirmity should deeply influence the mind of the epileptic, and produce a distaste for active occupations, especially for such as expose him to more than ordinary observation.

The causes and the radical cure of epilepsy are almost equally involved in mystery. It has been supposed by some to be dependent on an increased afflux of blood to the brain; while by other observers and pathological authorities it has been attributed, with about equal force of reasoning, to precisely the opposite condition. Certain cases undoubtedly depend upon organic disease, as tumours or injuries to the brain and its membranes, more especially near the surface. Local sources of irritation in other parts of the body have also been supposed to be exciting causes of epilepsy; and cases are recorded in which the disease has been cured by the amputation of a finger or the division of a nerve. The attention of recent observers has been especially directed to the medulla oblongata and Spinal Cord (q. v.), as being the most probable physiological seats of a disease so decidedly marked by convulsive movements. But as yet little more than the most vague theoretical inferences can be drawn from their researches as to the cause either of the morbid tendency in epilepsy or of the paroxysm. One of the most curious and suggestive of these recent facts is the experiment of Brown-Sequard, shewing that epilepsy, or a state closely resembling it, may be induced in certain animals by division of certain portions of the spinal cord, the artificial disease continuing long after the primary effects of the injury have ceased. A still more curious and inexplicable phenomenon has resulted from the multiplication of such experiments; for Brown-Sequard has shewn that in guinea-pigs this artificial epilepsy is sometimes propagated to the offspring, becoming, like the natural disease, a hereditary and congenital morbid tendency. On these strange facts it would be premature to indulge in speculation in this place, but their great importance can hardly be overlooked.

The condition of the epileptic seems to be favourably affected by everything which conduces to a quiet and hopeful state of the mind, and to a vigorous condition of the body. The treatment of the disease should therefore, in general terms, be of the kind termed *Tonic* (q. v.), and should be adapted with care, and after very minute and careful inquiry, to the removal of all the special bad habits, and occasional causes of depression, which tend to bring the system into a condition *below par*, in the individual case. The influence of a happy and quiet domestic life, without unhealthy excitement, and with proper occupations, varied by amusement and exercise in the open air, can hardly be overestimated. The marriage of epileptics is, however, not too readily to be sanctioned, as it has been known to be followed, not only by an increase of the disease, but by its transmission to a considerable portion of the family. On the other hand, a too absolute rule on this subject is not without its dangers, and perhaps the practical difficulties of the question are not to be met by any defined or dogmatic expression of opinion, founded on the general pathology of the disease. If the tendency exist, even slightly developed, upon both sides in such a connection, it needs hardly be stated that the dangers of transmission to the descendants is increased in a very great degree. Hence, intermarriages *within epileptic families* must be regarded as always in the highest degree imprudent. Parents and guardians are undoubtedly justified in making this disease an object of special solicitude, and reserve or concealment on this subject on either side, in the case of a proposed marriage, should be regarded as equally dishonourable with any other form of deception in a matter so important to the welfare of society and of the parties concerned.

According to one of the oldest and most respected of American physicians (Dr Jackson of Boston), the epileptic tendency may often be successfully treated by the systematic use of an exclusively vegetable diet, or by a very considerable reduction of the proportion of animal food. Among the innumerable remedies recommended by authorities, the salts of iron and zinc have perhaps the largest amount of experience in their favour; and Counter-irritants (q. v.) applied to the nape of the neck, or between the shoulders, either by blistering, the use of the seton, or even actual cautery, has been often followed by prolongation of the intervals, or decrease in the severity of the fits. Almost all the accredited remedies, however, have been observed to produce a temporary relief of this kind, even when without any permanent influence on the course of the disease.

Some of the *Lower Animals* are subject to epileptic fits. The disease is common in dogs and highly bred pigs. The creatures writhe with involuntary spasms, and are for the time without sight or hearing. Sometimes the muscles of the throat are so involved that fatal suffocation occurs. The attack is generally preceded by dulness, and lasts from ten to thirty minutes. It is generally traceable to torpidity or irregularity of the bowels, worms, debility, or plethora. In dogs, it is a frequent sequel of distemper. In cattle, it usually occurs in connection with the engorgement of the first or third stomachs; they throw themselves violently about, bellowing loudly, but seldom die. It is rare in horses, and differs from megrims, for which it is often mistaken, but in which there are no spasms. The treatment consists in freely opening the bowels, removing worms, if any are present, enjoining bleeding and spare diet, if the patient's condition is high, and generous feeding and tonics where it is low. The best preventives are carefully regulated diet, an occasional laxative, with a course of tonics, and especially of arsenic.

EPILO'BIUM, a genus of plants of the natural order *Onagraceæ*, having four deciduous calycine segments; four petals; a much elongated, 4-sided, 4-celled, 4-valved, many-seeded capsule; and seeds tufted with hairs at one end. The species are herbaceous perennials, natives of temperate and cold countries, and very widely diffused both in the northern and in the southern hemisphere. Some of them are very ornamental, from the beauty of their flowers. Most of the British species have small flowers, and some of them are very common in moist places. *E. angustifolium*, which differs from all the other British species in having the petals dissimilar in shape and size, is frequently planted in gardens and shrubberies, on account of its numerous and beautiful rose-coloured flowers; but its creeping roots are apt to overrun a flower-garden. It is sometimes called French Willow, from the resemblance of its stems and leaves to some kinds of willow, and the name Willow-herb is often extended to the whole genus. It is found in very northern regions, and its leaves and young shoots are sometimes a grateful addition to the meals of the arctic traveller, although not likely to be relished in almost any other circumstances. The pith, when dried, yields a quantity of sugar to boiling water, and is used in Kamtchatka for making a kind of ale, from which also vinegar is made.

Epilobium Angustifolium:
1, a flower; 2, a longitudinal section of a flower, shewing the arrangement of the ovules in the germen; 3, a seed.

E'PILOGUE (Gr. *epi*, upon or after, and *logos*, a speech) means, in oratory, the summing up or conclusion of a discourse; but, in connection with the drama, it denotes the short speech in prose or verse which frequently, in former times, was subjoined to plays, especially to comedies. The epilogue was always merry and familiar in its tone, and was intended to establish a kindly understanding between the actor and the audience, as well as to conciliate the latter for the faults of the play, if there were any, and to send them away in good-humour. One of the neatest and prettiest epilogues ever written, and one which completely realises what an epilogue should be, is that spoken by Rosalind at the conclusion of Shakspeare's *As You Like It*.

EPIME'NIDES, a Greek poet and priest, born probably at Phæstus in Crete, in the 6th or 7th c. B. C., and lived at Cnossus. His history has only reached us in a mythical form. He is said to have fallen asleep in a cave when a boy, and not to have wakened for 57 years. Like Rip Van Winkle, he was naturally much astonished and perplexed on his return to broad daylight. His period of slumber, however, had not passed away unprofitably. His soul, disengaging itself from its fleshly prison, betook itself in the interval to the study of medicine and natural philosophy; and when it had shuffled on again its mortal coil, E. found himself a man of great knowledge and wisdom. Goethe has written a poem on the subject, *Des Epimenides Erwachen*. E. went to Athens about 596 B. C., where, by the performance of various mystical rites and sacrifices, he stayed a plague with which the inhabitants were afflicted. When he died is not known, but we may be certain that he did not live (as is fabled) for 299 years. That he wrote the epic poems attributed to him, the longest of which was on the Argonautic expedition, is considered highly improbable. Compare Heinrich. *E. aus Kreta* (Leip. 1801).

EPINAL, a town of France, in the department of Vosges, is situated in a delightful district at the western base of the Vosges mountains, on both banks of the Moselle, about 200 miles east-south-east of Paris. Lat. 48° 10′ N., long. 6° 26′ E. It is a well-built, handsome town, with clean, regular, though badly paved streets, and is surmounted by the ruins of an old castle, the gardens attached to which are much admired. Among its chief buildings are the parish church, an antique Gothic structure; the hospital, formerly a Capuchin convent; a museum of pictures, antiquities, and natural history; the barracks; and the residence of the prefect of the department. E. manufactures chemical products, lace, block-tin, wrought-iron, pottery, cutlery, paper, and leather, and has some trade in grain, wine, timber, &c. Pop. 11,076.

EPIPHA'NIUS, St, a Christian bishop, and writer of the 4th c., was born of Jewish parents in Palestine. He was baptized in his 16th year, and was educated among the Egyptian monks, who inspired him with an aversion to all liberal science. He rose gradually to the rank of Bishop of Constantia (formerly Salamis) in Cyprus, and continued in that office from 367 till his death in 403. His polemical zeal was conspicuously manifested against Origen. He had proclaimed him a heretic in his writings, and in 394 he went to Palestine, the focus of Origen's adherents, and called upon John, Bishop of Jerusalem, and the two monks, Rufinus and Jerome, to condemn him. A more legitimate object of his violent opposition was the increasing worship of images. Jerome relates how he indignantly tore down an image in the precincts of a church in Palestine, as being contrary to the divine law. Among his writings, collected by Petavius (2 vols., Paris, 1622), the most important is his *Panarion*, or catalogue of all heresies (80 in number), a work which strikingly shews his unfitness for being a historian. His credulity and want of honesty are excessive.

EPI'PHANY (Gr. *Epipháneia*, appearance), denoted, among the heathen Greeks, a festival held in commemoration of the appearance of a god in any particular place. The word subsequently passed into the usage of the Christian Church, and was used to designate the manifestation or appearance of Christ upon the earth to the Gentiles, with especial reference to the day on which he was seen and worshipped by the wise men who came from the East. This occasion is commemorated in the church on the 6th of January, the 12th day after Christmas, and hence the Epiphany is also called Twelfth Day. The Epiphany, which is said not to have been observed as a separate festival, but to have been included in the feast of the Nativity till 813, is observed as a 'scarlet day' at Oxford and Cambridge.

E'PIPHYTES (Gr. *epi*, upon, *phyton*, a plant), often and popularly, but less correctly, called AIR-PLANTS, are plants which are not rooted in the ground, but are attached to trees, from the decaying portions of the bark of which, or of mosses and lichens which grow upon it, they derive their nutriment, probably, also, depending upon the air for it to a larger extent than other plants do. Mosses and lichens themselves, growing upon trees, may be called E., but the term is generally used of phanerogamous plants. E. are not connected with the trees on which they grow in the peculiar manner of the misletoe, *Balanophora*, and other true parasites—not sending roots like them into the wood to suck the juice of the tree. It is chiefly in warm climates that phanerogamous E. are found, and in those which are also moist. Most of them prefer shady situations. Within the tropics, they often form an interesting and remarkable feature of the vegetation. Some of the *Bromeliaceæ* (as *Tillandsia*), *Cactaceæ*, *Araceæ*, *Gesneraceæ*, and other natural orders are E.; but the order to which they belong more than to any other is *Orchidaceæ*. Many of the epiphytous orchids, as well as other E., are remarkable for their beauty; and the attention which has recently been given to their cultivation in hothouses has been rewarded by the most perfect success. See ORCHIDS. Plants which usually occur as E. are sometimes also found growing on rocks. Although seldom found except in moist climates, E. are generally capable of enduring a considerable amount of drought, parting slowly with the moisture which they have once imbibed.

EPI'RUS, the ancient name of a part of Greece, bounded on the E. by the chain of Pindus, on the S. by the Ambracian Gulf, on the W. by the Ionian Sea, and on the N. by Illyria and Macedonia. It formed the southern part of modern Albania, or the pashalic of Janina, a wild and mountainous region, the haunt of robbers and semi-civilised tribes in all ages. The chief town was Dodona (q. v.); the chief rivers, the Acheron, Cocytus, Arachthus, and Charadrus. Anciently, it was celebrated for its cattle and its breed of Molossian dogs. Its earliest inhabitants were probably Pelasgians. In the historic period, Theopompus speaks of fourteen tribes, most of whom were believed by the Greeks themselves to be not of Hellenic origin. The principal were the Chaones, Threspoti, and Molossi, the last of whom finally obtained the entire sovereignty of the country. Of the Molossian kings of E., the most distinguished was Pyrrhus, who long waged successful war against the Romans. But after this race of kings became extinct (239—229 B. C.) by the death of Ptolemy, grandson of Pyrrhus, a republican constitution was adopted, whereupon parties sprang up among them, and the neighbouring Macedonians got the upper hand. On the conquest of Macedonia by the Romans (168 B. C.), the Epirots were accused of having assisted Perseus, the Macedonian king, and the most revengeful measures were put in force against them. Æmilius Paulus, the Roman general, plundered and razed to the ground the 70 towns of E., and sold into slavery 150,000 of the inhabitants. From this period, the country became a Roman province, and shared the vicissitudes of the Roman and Byzantine empires, until 1204, when one of the Comneni made himself independent. This dynasty, known as the *despots of Albania*, ruled E. until 1466, when it was finally conquered by the Turks; the last 'despot,' Georg. Castriota, better known as Skanderbeg (q. v.), having for more than 20 years heroically resisted the hordes of the Ottoman empire.

EPI'SCOPACY (Gr. *episcopos*, bishop or overseer) is that form of church government in which one order of the clergy is superior to another—namely, bishops or prelates to priests or presbyters, the ordinary ministers of parishes or congregations. It is sometimes called *diocesan episcopacy*, to distinguish it from that *episcopacy* which Presbyterians and Independents also assert—the oversight of flocks by their pastors. See BISHOP. It is not essential to episcopacy that there should be *archbishops*, exalted in rank and authority above other bishops, although of the same order: and in some Episcopalian churches there are none.

Episcopacy has actually subsisted under very various modifications; the power of bishops being more or less absolute, or more or less controlled by synods of presbyters, or even—in the Protestant Episcopal Church of the United States—by a diocesan convention, composed both of presbyters and lay delegates. The power of the bishop is also variously affected by the relations subsisting between church and state; and great differences exist in this respect between the Church of England, the Church of Sweden, and the Church of Denmark, all Episcopalian, and all connected with the state as *established* churches.

The Church of Rome, the Greek Church, and other branches of the Eastern Church, are Episcopalian. Of Episcopalian Protestant churches not established, the most important are that in the United States, that in Scotland, and the Moravian Church. See ANGLICAN CHURCH; ENGLAND, CHURCH OF; and SCOTTISH EPISCOPAL CHURCH.

EPISCO'PIUS, SIMON (whose Dutch name was Bisschop), the head of the Arminian party after the death of Arminius, was born at Amsterdam in 1583, studied at Leyden, took his degree in 1606, and was ordained pastor of the village of Bleyswyck near Rotterdam in 1610. In the following year, the States-general, with the intention of putting an end to the agitations created by the controversies between the Gomarists or Calvinistic party and the Arminians or Remonstrants, ordered a conference to be held in their presence at the Hague between six ministers of each party. E. was one of the six charged with the advocacy of Arminianism, and highly distinguished himself by his good temper, ability, and learning. In 1612, the curators of the university of Leyden appointed him professor of theology in the room of Gomar, who had gone to Seeland. This enraged the leaders of the orthodox party, who unscrupulously accused him of Socinianism, and of having entered into an alliance with the Roman Catholics for the destruction of Protestantism. By this means the fanaticism of the populace was roused against him; he was insulted and abused in the street, and on one occasion narrowly escaped being stoned to death. The house of his brother in Amsterdam was also sacked, under the pretext that it was a rendezvous of the Remonstrants. In 1618, occurred the famous Synod of Dort (q. v.). E. was present, along with several other Arminians. The Calvinists, who happened to be in an overwhelming majority, would not allow him to speak; they told him that the synod was met not to discuss, but to judge; and, in fact, the whole proceedings exhibited as revolting a specimen of high-handed tyranny as any on record, even among ecclesiastical tribunals. Expelled from the church, and banished from the country, E. betook himself first to Antwerp, and afterwards to Rouen and Paris, but in 1626 returned to Rotterdam, where the *odium theologicum* against his party had become less virulent. Here he married in 1630, and four years after was made primarius professor of divinity in the newly established college of the Remonstrants. He died in 1643. E. held enlightened principles in regard to religious toleration. Not placing a high value on merely doctrinal views, but rather believing in the efficacy of the Christian spirit to elevate and purify the character, and seeing, moreover, the presence of this spirit in men holding the most conflicting opinions (when not inflamed with controversial hates), he would have wished a broader and more catholic bond of unity among Christians than the opinionative creeds of his day permitted. His chief works are his *Confessio Remonstrantium* (1621), *Apologia pro Confessione* (1629), and *Institutiones Theologicæ*, incomplete. A complete edition of his works appeared at Amsterdam in 2 vols., 1650.

EPISTLE. The lesson in the church service called the Epistle, derives its name from being most frequently taken from the Apostolic Epistles, although it is sometimes also taken from other parts of Scripture. This part of the service is believed to be as old as the 6th century.

EPISTLE SIDE OF THE ALTAR, the left side of the altar or communion table, looking from it, at which in the church service the epistle of the day is read. It is of lesser distinction than the right or gospel side, and is occupied by the clergyman of lower ecclesiastical rank. The reader of the epistle was in former times called the Epistler.

EPISTOLÆ OBSCURORUM VIRORUM (Lat. Letters of Obscure Men) is the title of a collection of satirical letters which appeared at the commencement of the 16th c., and professed to be the composition of certain ecclesiastics and professors in Cologne and other places in Rhenish Germany. They were directed against the scholastics and monks, and lashed with merciless severity their doctrines, writings, morals, modes of speech, manner of life, follies and extravagances, and thus helped in no small degree to bring about the Reformation. The controversy of Reuchlin with the baptized Jew, Pfefferkorn, concerning Hebrew punctuation, gave the first occasion to the *Epistolæ*, and it is probable that their title itself was suggested by the *Epistolæ Clarorum Virorum ad Reuchlinum Phorcensum* (1514). They were addressed to Octuin Gratius in Deventer, who was by no means so complete an ignoramus as might be supposed from this circumstance, but who had made himself odious to the liberal minds of the time by his arrogant pretension and his determined hostility to the spirit of his age. On the first appearance of the work, it was fathered on Reuchlin; afterwards, it was ascribed to Reuchlin, Erasmus, and Hutten. More recent investigators have inclined to the belief, that the *first* part, which appeared at Hagenau in 1515 (but professedly at Venice), was the production of Wolfgang Angst, a learned and witty book-printer of that town; but, latterly, doubt has also been expressed whether even he had anything to do with the *Epistolæ*. In the composition of the second part (published in 1519), after Ulrich von Hutten, Erotus Rubeanus had the most considerable share. The circumstance of the *Epistolæ* being placed in the catalogue of forbidden books by a papal bull, helped to spread it not a little. Among the numerous editions of the work may be mentioned those published at Frankfort (1643), Mettaire's (Lond. 1703), Münch's (Leip. 1827), and Rotermund's (Hanov. 1827).

E′PITAPH (Gr. *epi*, upon, and *taphos*, a hillock, mound, or other monument placed over a grave). From originally signifying a monument, this word is now used exclusively to designate the inscription commemorative of the deceased which is placed upon the monument. This perversion may in some measure have arisen from the remembrance of the funeral orations which the ancients were in the habit of pronouncing at funerals. But the epitaph, in its stricter sense, was well known to the classical nations of antiquity; and, indeed, by every people a brief commemoration of the heroic actions or personal virtues of their illustrious dead has been regarded as one of the worthiest occupations of the faculties of the living. As epitaphs were not only engraved on the most enduring substances, but from their brevity were easily preserved in the memory and orally transmitted, wherever we find the literature of a people at all we are pretty sure to discover specimens of their epitaphs. Pettigrew has translated several from Egyptian sarcophagi (Bohn's edition, p. 5), but they are of no great interest. Herodotus (vii. 228) has preserved to us those which the Amphictyons caused to be inscribed on the columns which they raised in honour of the heroes of Thermopylæ, and that which Simonides, from personal friendship, placed on the tomb of the prophet Megistias. The general inscription for the whole of them was to this effect: 'Four thousand from Peloponnesus once fought on this spot with three hundred myriads;' and that which was special to the Spartans was still more memorable: 'Stranger, go tell the Lacedemonians that we lie here obedient to their commands.' The *Anthologia Græca*, edited by Brunk, and subsequently by Jacobs, contains the largest collection of Greek epitaphs: of these many were translated and published by Bohn in 1854, under the editorial care of Mr George Burges. Of Roman epitaphs every antiquarian museum even in this country presents numerous examples; for the form in which they were conceived was adopted by our own Romanised forefathers, and many a stone bearing the well-known *D. M.* (*Diis Manibus*), or *Siste Viator*, probably covered the remains of those whose veins never contained a drop of Roman blood. A very interesting collection of early Christian epitaphs will be found in Dr Charles Maitland's *Church in the Catacombs*, published in 1846. The naturally epigrammatic turn of the French mind peculiarly adapts it for this species of composition, and in French collections, such as the *Recueil d'Epitaphes*, very felicitous examples are to be found both in Latin and in French. Of the former may be mentioned the 'Tandem felix!' which the Count de Tenia, who had enjoyed every form of temporal prosperity, caused to be engraved on his tomb; and of the latter, the touching epitaph to a mother, 'La première au rendez-vous.' A large portion of the earlier monuments, and consequently of the epitaphs of this country, were destroyed at the Reformation, and subsequently by the iconoclastic rage of the Puritans and Presbyterians. But when we come down to a later date, the literature of no people, either ancient or modern, can vie with our own in this peculiar branch, for whilst English epitaphs possess the point and terseness without which no epitaph can be successful, they exhibit a feature almost unknown in those of other nations—that, viz., of wit, or more properly speaking, perhaps, of humour. It seems as if the wittiest people in the world, as the English unquestionably are, had found it impossible to confine their raillery to the living, and accordingly we find that the harmless peculiarities of the dead have often been hit off on a tombstone, with a felicity which has rendered immortal what otherwise the next generation must have forgotten. Of this class of epitaphs our collections present an almost infinite variety. There are many excellent old collections of epitaphs, such as the *Thesaurus Epitaphiorum* of Philip Labbe, Paris, 1666. Of modern ones, the best is that of Pettigrew, published by Bohn, which is so arranged as to mark the diversity of taste prevailing at different periods of our history. See also the works of Gruter, Græsius, Reinesius, Muratori, Mazochius; the *Monumenta Anglicana*, London, 1719; Weever's *Ancient Funeral Monuments*, &c.

EPITHALA′MIUM was a species of poem which it was the custom among the Greeks and Romans to sing in chorus near the bridal-chamber (*thalamus*) of a newly married couple. Anacreon, Stesichorus, and Pindar composed poems of this kind, but only scanty fragments have been preserved. The epithalamium of Peleus and Thetis by Catullus is one of the finest specimens of Latin poetry extant; but probably the most gorgeous epithalamium in all literature, is that of the English poet Spenser. A collection of Greek and Latin epithalamia is to be found in Wernsdorf's *Poetæ Latini Minores* (4th vol., part 2).

EPITHE′LIUM is the term applied in anatomy to the cell-tissue which, in layers of various thickness, invests not only the outer surface of the body, and the mucous membranes connected with it—as, for example, those of the nose, lungs, intestinal canal, &c.—but also the closed cavities of the body, such as the great serous membranes, the ventricles of the brain, the synovial membranes of joints, the interior of the heart and of the blood-vessels proceeding to and from it, the ducts of glands, &c.

The thickness of this tissue varies extremely with the position in which it occurs. In some parts it consists of numerous strata of cells, collectively forming a layer of more than a line in thickness; in other parts, it is composed of only a few strata, or often of only a single stratum of cells, and can only be detected by the microscope.

The cells of which the epithelium is composed are usually soft nucleated cells; they may be rounded, polygonal, fusiform, cylindrical, or conical in shape, and sometimes they possess vibratile cilia, the appearance and uses of which will presently be explained.

In his *Manual of Human Histology*, Kölliker adopts the following arrangement. He considers (*a*) epithelium in a single stratum, and (*b*) epithelium in many layers.

(*a*) *Epithelium in a single stratum* may be composed of

1. *Rounded, polygonal cells*, constituting the variety known as pavement or tesselated epithelium, and occurring as an investment of the serous membranes, of most synovial membranes, of the lining

membrane of the heart and of the veins, of the canals of glands, &c.

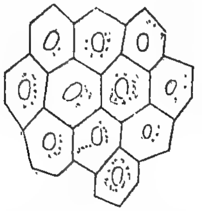

Fig. 1.
Epidermis (still soft like the epithelium of internal parts) of a two months' human embryo. Mag. 350 diam.

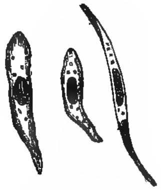

Fig. 2.
Epithelial cells of the vessels; the longer one from the arteries, the shorter ones from the veins.

2. *Fusiform, superficially united cells* (fusiform epithelium), as the epithelium of the arteries and of many veins.

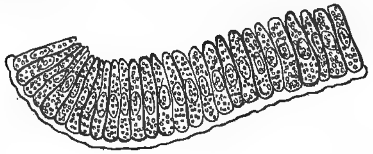

Fig. 3.
Epithelium of the intestinal villi of the rabbit. Mag. 300 diam.

3. *Cylindrical cells* (cylinder epithelium), as in the intestine from the stomach to the termination of the alimentary canal, in the excretory ducts of all the glands opening into the intestine, &c. Various illustrations of this cylinder epithelium are given in the article Digestion, Organs and Process of.

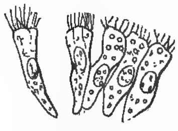

Fig. 4.
Ciliated cells from the finer bronchial tubes. Mag. 350 diam.

4. *Cylindrical or conical ciliated cells,* as the epithelium of the more minute bronchial tubes, of the nasal cavities, and of the uterus.

5. *Rounded ciliated cells,* as the ciliated pavement epithelium of the ventricles of the brain in the fœtus.

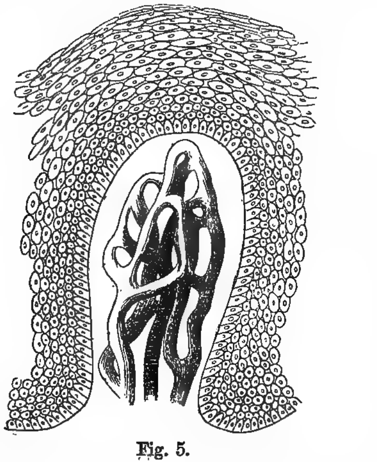

Fig. 5.
Laminated pavement epithelium investing a simple papilla (with blood-vessels in the interior) from the gums of a child. Mag. 250 diam.

(*b*) *Epithelium in many layers* may be composed of:
1. *Cylindrical or rounded cells below, and more or less flattened cells above.* This is termed laminated pavement epithelium, and occurs in the mouth, lower part of pharynx, œsophagus, bladder, &c.

2. *Rounded cells below, more elongated ones in the middle, and ciliated conical ones above.* This is termed laminated ciliary epithelium, and occurs in the larynx, trachea, and larger bronchial tubes, in the greater part of the nasal cavity, &c.

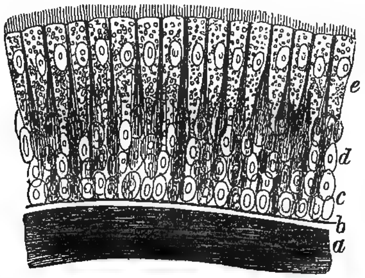

Fig. 6.
Ciliated epithelium from the trachea of a man. Mag. 350 diam. *a*, outermost part of the elastic longitudinal fibres; *b*, homogeneous outermost layer of the mucous membrane; *c*, deepest round cells; *d*, median long cells; *e*, outermost conical ciliated cells.

In all the varieties of epithelium, the layer of external cells is being constantly disintegrated and replaced by the layer immediately beneath.

The uses of the chief varieties of epithelium, especially of ciliated epithelium, require some notice.

The polygonal or pavement epithelium mainly acts like the epidermis, as a protecting medium to the soft parts beneath.

The cylindrical epithelium additionally takes an active part in the process of secretion. Illustrations of the function of the cells forming this variety of epithelium are given in the articles Cells, Animal; Digestion, Organs and Process of; and the subject will be further noticed under the head Secretion.

In connection with ciliated epithelium, we must notice *ciliary motion* generally, in so far as it occurs in the animal kingdom. Certain surfaces which are lubricated by a fluid, are covered with a multitude of hair-like processes of extreme delicacy and minuteness (their length varying from $\frac{1}{1000}$ to $\frac{1}{12000}$ of an inch), which from their shape are termed *cilia*, from *cilium*, an eyelash. During life, and for a certain period after death, these filaments exhibit a remarkable movement, each cilium bending rapidly in one direction, and rapidly returning to its original position (according to Krause, these movements range from 190 to 230 in a minute). On examining a ciliated surface with a high magnifying power, the motion presents an appearance somewhat resembling that of a cornfield agitated by a steady breeze. Any minute objects coming in contact with the free extremities of the cilia are urged onward in the direction of the predominant movement; and the best method of observing the course of the ciliary current is to sprinkle the surface with a little powdered charcoal, grains of which may speedily be seen to move onwards in a definite direction.

An easy way to observe this phenomenon is to detach, by scraping with a knife, a small piece of epithelium from the back of the throat of a living frog. The scales, moistened with water or serum, will continue to exhibit the movement of their adherent cilia for a very considerable time, provided the piece be kept duly moistened. On one occasion, a piece prepared in this way by Mr Bowman and Dr Todd exhibited motion for seventeen hours; and it would probably have continued doing so for a longer time, had not the moisture around it evaporated; and if the epithelium is not removed from the body of an animal that has been killed, the motion continues much longer. In a turtle, after death by decapitation, it lasted, in the mouth, nine days; in the trachea and lungs, thirteen days; and in the œsophagus, sixteen days. In man and mammals, it seldom lasts two days, and usually ceases much sooner. The necessary condition for their movement appears to be the integrity of the cells to which they are attached; for as soon as these shrink up for want of moisture, or undergo any physical change, the cilia cease their characteristic action. We know nothing with certainty regarding the mechanism or source of ciliary motion, except that (as it continues on detached epithelium) it is independent of both the vascular and nervous systems.

This phenomenon exists very widely throughout the animal kingdom. Dr Sharpey, in his article CILIA* (published more than a quarter of a century ago), notices its occurrence in the Infusoria, in Polyps and their ova, in Acalephæ, Actiniæ, Echinodermata, Annelida, Mollusca, and the Molluscoids (e. g., Ascidians), in Reptiles, Birds, and Mammals. Since the date of that article, it has been discovered in Sponges, and in one or two exceptional cases in Fishes; but it has never been found in any part of the body of Articulata (Crustaceans, Insects, or Arachnidans). The parts on which it occurs are (1), the skin or surface of the body, (2) the respiratory, (3) the alimentary, and (4) the genito-urinary systems; and it has been observed in the ova of numerous classes of animals, from Reptiles downwards to Infusoria. In most of the parts in which we observe it, its use appears to be of a mechanical nature—viz., to convey the fluids or other matters along the surfaces on which the cilia exist, or, as in the Infusoria, to carry the entire animal through the water.

1. Cilia have been found on the external surface in Batrachian larvæ, in Mollusca, Annelida, Echinodermata, Actiniæ, Medusæ, Polypi, and Infusoria. In most cases, their function is respiratory, but in many instances it is also locomotive or prehensile.

2. Ciliary motion has been observed on the lining membrane of the air-passages of Mammals, Birds, and Reptiles, where, whatever may be its other uses, it serves to convey the secretions along the membranes, together with any foreign matters that may be present. It exists also on the external gills of Batrachian larvæ, and on the respiratory organs of Mollusca and Annelida. The cilia which exist externally on still lower animals without separate respiratory organs, assist in the respiratory process, by renewing the water on the surface.

3. It occurs in the mouth, throat, and gullet of various reptiles, and in the alimentary canal of the Mollusca, Echinodermata, many Annelida, and Acalephæ. It is not easy, as Dr Sharpey observes, to see the purpose of the motion in all these cases. In some, it may merely convey secreted matters along the surface of the lining membrane; and in others it seems to serve in place of ordinary deglutition, to carry food into the stomach.

4. It is observed on the surface of the reproductive organs of Mammals, Birds, and Reptiles. From the direction of the current being from without inwards, the office of the cilia may be to hurry down the ovum, in addition to removing the mucous secretion of the membrane.

In Reptiles and Fishes, ciliary motion exists at the neck of each uriniferous tube. The movement is directed towards the tube, and favours the flow of the watery portion of the secretion towards it.

There are some situations, both in man and the lower animals, in which it is difficult to determine what functions the ciliary motion can perform, as, for example, in man, in the ventricles of the brain; and in the frog, in the closed cavities of the pericardium and peritoneum.

EPIZO'A. This term is applied to those parasitic creatures which live on the bodies of other animals, and derive their nourishment from the skin. Our space will only allow of our noticing those that infest man. They may be divided into two groups: (1) Those which live upon the surface of the skin, and (2) those which live in the skin. Fleas, lice, bugs, ticks, &c., belong to the first group; the Itch-insect or *Sarcoptes*, the Pimple-mite or *Demodex folliculorum*, and possibly some other species of the *Acaridæ*, to the second.

In a zoological point of view, all the E. that infest the human subject are Insects or Arachnidans. The parasitic insects are: I. *Pulicida*, or *Fleas*, including—1. The Common Flea, or *Pulex irritans;* 2. The Sand-flea, or *Pulex penetrans*, known also as the Chigo, Chigger, &c. II. *Acanthida*, or *Soft Bugs*, including the common Bed Bug or *Acanthia* (s. *Cimex*) *lectularia.* III. *Pediculida*, or *Lice*, including—1. The Common Louse, or *Pediculus capitis;* 2. The Body Louse, or *Pediculus vestimenti;* 3. The Crab Louse, or *Pediculus* (s. *Phthirius*) *pubis;* 4. The Louse occurring in Phthiriasis, or *Pediculus tabescentium.*

The parasitic Arachnidans belong to the order of *Acarida*, or Mites; indeed, most of the animals forming the different families of this order lead a parasitic existence. We have—I. *Demodicida*, including the Pimple-mite or *Demodex* (s. *Acarus*) *folliculorum* (the dog and the sheep possess each a special demodex). II. *Sarcoptida*, including the Itch-mite or *Sarcoptes* (s. *Acarus*) *Scabiei.* (Most of our domestic animals seem to be infested by a special sarcoptes, the species of which are numerous.) III. *Ixodida* or Ticks, including—1. The American Tick or *Ixodes hominis* (common in Brazil); 2. The Common Wood-tick (Dogs' Tick), or *Ixodes ricinus.* There are probably many species of Ixodes which are occasionally found on man. IV. *Gamasida*, or Beetle Lice, including—1. The Bird-mite, or *Dermanyssus avium* (occasionally found on sickly persons); 2. The Miana Bug, or *Argas persicus* (common in some parts of Persia, and especially at Miana); 3. The Chincha Bug, or *Argas chinche* (occurring in Columbia). V. *Orobatida*, or Grass-lice, including the Harvest-Bug, or *Leptus autumnalis.* See the articles BUGS, FLEAS, ITCH INSECT, LICE, TICKS.

EPIZÖO'TICS (Gr. *epi*, upon, and *zöon*, an animal) are diseases of animals which manifest a common character, and prevail at the same time over considerable tracts of country. Like epidemics, they appear to depend upon some peculiar and not well ascertained atmospheric causes; where the cases are neglected or overcrowded, they also frequently become contagious; they are apt to take on a low type of fever, and are better treated by supporting than by reducing remedies. Influenza in horses, and pleuro-pneumonia and vesicular epizootic in cattle, are examples.

E'POCH, in Chronology. See CHRONOLOGY.

EPOCH, in Astronomy, is an abbreviation for 'longitude at the epoch;' it means the mean heliocentric longitude of a planet in its orbit at any given time—the beginning of a century, for instance. The epoch of a planet for a particular year is its mean longitude at mean noon, on January 1, when it is leap year, and on December 31 of the preceding year, when it is a common year. The epoch is one of the elements of a planet's orbit.

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* In the *Cyclopædia of Anatomy and Physiology.*

E'PODE is the last part of the chorus of the ancient Greeks, which they sung after the strophe and antistrophe, when the singers had returned to their original place. The epode had its peculiar measure of syllables and number of verses. See Chorus.

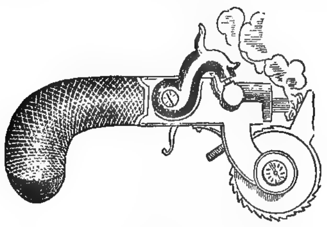
E'PPING, a town in the west of Essex county, England, in a pleasant healthy situation, at the north end of Epping Forest, 16 miles north-north-east of London. It has a very irregular appearance. Pop. (1861) 2102. It is noted for its cream, butter, sausages, and pork. It sends large quantities of butter to London. Epping Royal Forest, formerly under the name of Waltham Forest, where our ancient kings enjoyed much sport, covered all Essex, and extended almost to London. It is now limited to 60,000 acres in the south-west part of the county. Of this tract, only 12,000 acres are in wastes and woods, the rest being now enclosed as private property. In the forest, 5 miles from E., is Queen Elizabeth's hunting-lodge. Separated by the river Roding from Epping Forest is Hainault Forest, lately disforested. Here for many centuries a fair was held under the enormous Fairlop oak, not now existing, and a stag was yearly turned out in the Forest on Easter Monday, for the amusement of the public. To this day, a stag is turned out yearly for the amusement of Cockney huntsmen.

EPROUVETTE is a machine for proving or testing the strength of gunpowder. It was invented or suggested in the last century by Robins, but was greatly improved by Dr Hutton.

The *gun* eprouvette determines the strength of gunpowder by the amount of recoil produced. A small gun, usually a 'half-pounder,' is fixed to the lower end of an iron rod; its base being adjusted to an arm projecting from the rod: or else it is suspended from an iron frame. A horizontal steel axis is fixed to the rod or frame about which the gun may vibrate. A pointed iron rod or style projects downwards from the lower side of the gun, and touches a groove filled with soft wax; the groove is so shaped that, when the gun recoils, the point cuts a path for itself along this wax; and the length of this path determines the amount of recoil. Sometimes a brass graduated arc with an index is used instead of the pointed style and the waxed groove; but the principle of action is just the same. On the arc the recoil should vary from 26° for new fine-grain powder to 20° 5′ for old powder of coarse grain. This system of proof is resorted to annually at minor and foreign stations for the proof of all powder in store, to ascertain the amount of deterioration; five rounds constitute the minimum proof. Before the eprouvette is resorted to, the powder must pass the test of specific gravity, by weighing not less than 55 lbs. to the cubic foot.

The *mortar* eprouvette determines the strength of gunpowder by the distance to which a ball is projected, instead of the distance to which the piece recoils. It is generally a mortar of 8-inch bore, in which 2 to 4 ounces of powder is employed to propel an accurately turned iron shot to a distance of about 120 yards. Other things being equal, the strongest gunpowder sends the shot to the greatest distance; and this is the usual mode adopted in testing gunpowder supplied to the government by various contractors.

The ordinary eprouvette is an instrument shaped like a small pistol without a barrel, and having its breach chamber closed by a flat plate connected with a strong spring. On the explosion of the powder against the plate, it is driven back to a distance indexed according to the strength of the powder, and is retained at its extreme state of propulsion by a ratchet wheel.



Eprouvette.

E'PSOM (said to have originally been Ebbasham) is a small market-town on the margin of the Banstead Downs in Surrey, 15 miles south-south-west of London by road, and 14 miles by the London and South-Western Railway. The famed sulphate of magnesia springs of E. gave their name to the Epsom Salts formerly manufactured from them. This manufacture has been abandoned from the ease with which these salts can be made artificially. The Royal Medical College, erected on the Downs, and established in 1851, provides education for about 170 boys, the sons of medical men, and affords a home to decayed members of the profession and their widows. Pop. (1861) 4882. On the Downs, $1\frac{1}{2}$ mile south of the town, the famous E. horse-races are held yearly. They are said to have been instituted by Charles I., but have become of greater importance since the institution of the Derby Stakes in 1780 (see Derby Day). The races last four days, and as many as 100,000 persons often assemble to witness the most important of them.

EPSOM SALT, or SU'LPHATE OF MAGNE'SIA ($MgO+SO_3HO$), occurs not only in the water of mineral springs, as at Epsom, Seidlitz, and many other places; but also as an efflorescence on the surface of various rocks, sometimes along with alum, as at Hurlet, in Renfrewshire; and on the ground, as in some parts of Spain and of the Russian steppes. It sometimes occurs snow-white and very pure, sometimes discoloured by impurities; and is either in the form of fine thread-like crystals, or in crusts, flakes, granules, &c. Its crystals are prisms, almost rectangular. For purposes of commerce, it is obtained by the action of dilute sulphuric acid upon magnesian limestone. See Magnesia.

Epsom salt is a well-known purgative remedy much in use in household medicine. It may be given in doses from two drachms to one ounce, according to the effect required, in a tumbler of water. The disagreeable bitter taste is much relieved by acidulating with nearly a teaspoonful of dilute sulphuric acid to each ounce of salt.

E'PWORTH, a town in the north-west of Lincolnshire, England, 30 miles north-north-west of Lincoln. It chiefly consists of one street, above two miles long. The chief employments are hemp and flax dressing, rope-making and malting. Pop. (1861) 2197. John Wesley, founder of Methodism, as well as Kilham, founder of the seceding Wesleyans, was born here.

E'QUABLE MOTION is that by which equal spaces are passed over in equal times.

EQUA'LITY. See Liberty, Equality, Fraternity.

EQUA'TION, Annual, one of the most conspicuous of the subordinate fluctuations in the

CORNELL

moon's motion, due to the action of the sun, which increases with its proximity to the earth and her satellite. It consists in an alternate increase and decrease in her longitude, corresponding with the earth's situation in its annual orbit, i. e., to its angular distance from the perihelion, and therefore having a year instead of a month, or aliquot part of a month, for its period. For an explanation of the mode of its production, the reader is referred to Herschel's *Outlines of Astronomy*, art. 738, *et seq.* The subject is too abstruse for explanation in this work.

EQUATION, Differential, is an equation involving differential coefficients (see Calculus); such is $\frac{d^3y}{dx^3} + a\frac{dy}{dx} = x$; from which it is required to find the relation between y and x. The theory of the solution of such equations is an extension of the integral calculus, and is a branch of study of the highest importance.

EQUATION, Functional. See Functions.

EQUATION, Lunar. See Lunar Theory.

EQUATION OF E'QUINOXES is the difference between the true position of the equinoxes, and the position calculated on the supposition that their motion is uniform. See Precession.

EQUATION OF LIGHT. In astronomical observations, the visual ray by which we see any body is not that which it emits at the moment we look at it, but that which it *did* emit some time before, viz., the time occupied by light in traversing the interval which separates it from us. If, then, the body be in motion, its aberration, as due to the earth's velocity, must be applied as a correction, not to the line joining the earth's place at the moment of observation with that occupied by the body, (as seen) at the same moment, but at that antecedent moment when the ray quitted it. Hence is derived a rule applied by astronomers for the rectification of observations made on a moving body, viz., from the known laws of its motion and the earth's, calculate its relative angular motion in the time taken by light to pass from it to the earth. This motion is the total amount of its apparent displacement. Its effect is to displace the body in a direction contrary to its apparent motion, an effect one part of which is due to aberration, properly so called (see Aberration), resulting from the composition of the motions of the earth and of light, and another part to the fact of the passage of light occupying time. The *equation of light* is the allowance to be made for the *time* occupied by the light in traversing a variable space.

EQUATION OF PAYMENTS. The problem considered under this head in books of arithmetic is to find a time when, if a sum of money be paid by a debtor, which is equal to the sum of several debts payable by him at different times, no loss will be sustained by either the debtor or creditor. The rule generally given is as follows: Multiply each sum due by the time at which it is payable, and then divide the sum of the products by the sum of the debts: the quotient is the equated time. For example, if £10 be due at one month, and £20 at two months, find as an equivalent when the whole £30 may be paid at once. Ans. $\frac{10 \times 1 + 20 \times 2}{30} = 1\frac{2}{3}$ months. This rule is, however, incorrect where the debts are unequal, because it takes no account of the balance of interest and discount. A correct rule for the case of two debts and simple interest is subjoined. Let d and D denote the debts, t and T the times of payment, and r one year's interest on D. Then if $A = T + t + \frac{D + d}{dr}$, and $B = Tt + \frac{DT + dt}{dr}$, the equated time will $= \frac{1}{2}A - \frac{1}{2}\sqrt{(A^2 - 4B)}$. When three or more debts are concerned, the plan is to find by this formula the equated time for the first two, and then for their sum payable at their equated time, and the third, and so on. The common rule is, however, sufficiently correct for ordinary use.

EQUATION OF THE CENTRE. If the earth moved uniformly round the sun in a circle, it would be easy to calculate its longitude or distance from the line of equinoxes at any time. One year would be to the time since the vernal equinox as 360° to the arc of longitude passed over. But the orbit of the earth is not circular, nor is its motion uniform; the orbit is slightly elliptical, and the motion is quicker at perihelion than at aphelion. The true rule, then, for ascertaining the earth's longitude is contained in the following proportion: one year is to the time elapsed as the whole area of the earth's orbit is to the area swept over by the radius vector in the time. This is a deduction from Kepler's law (see Central Forces), that, in planetary motion, equal areas (not *angles*) are swept over in equal times. The area swept over being ascertained from the laws of the earth's motion, and the elements of its orbit, it is a question of geometry to ascertain the *angle* corresponding to the area, or the true longitude. In astronomy, the longitude, as calculated on the supposition that the earth moves uniformly in a circle, is called the *mean* longitude of the earth; and it happens, from the orbit being, as we said, but slightly different from a circle, that the mean and true longitude differ but slightly. The quantity by which the true and mean longitudes differ is called the *equation of the centre;* and this is sometimes to be added to, and sometimes to be subtracted from the mean longitude, to obtain the true; and sometimes it is zero.

EQUATION OF TIME. It will be seen from the article Equation of the Centre (q. v.) that the earth's motion in the ecliptic—or what is the same thing, the sun's apparent motion in longitude—is not uniform. This want of uniformity would of itself obviously cause an irregularity in the time of the sun's coming to the meridian on successive days; but besides this want of uniformity in the sun's apparent motion in the ecliptic, there is another cause of inequality in the time of its coming on the meridian—viz., the obliquity of the ecliptic to the equinoctial. Even if the sun moved in the equinoctial, there would be an inequality in this respect, owing to its want of uniform motion; and even if it moved uniformly in the ecliptic, there would be such an inequality, owing to the obliquity of its orbit to the equinoctial. These two independent causes conjointly produce the inequality in the time of its appearance on the meridian, the correction for which is the equation of time.

When the sun's centre comes to the meridian, it is apparent noon, and if it moved uniformly on the equinoctial, this would always coincide with *mean noon*, or 12 o'clock on a good solar clock. But from the causes above explained, mean and apparent noon differ, the latter taking place sometimes as much as $16\frac{1}{4}$ minutes before the former, and at others as much as $14\frac{1}{2}$ minutes after. The difference for any day, called, as we have said, the equation of time, is to be found inserted in ephemerides for every day of the year. It is nothing or zero at four different times in the year, at which the whole mean and unequal motions exactly agree—viz., about the 15th of April, the 15th of June, the 31st August, and the 24th December. At all other times, the sun is either too fast or too slow for clock-time. In the ephemerides above referred to, the sign + or — is prefixed to the equation of time, according as it is to be added to or subtracted from the apparent time to give the mean time. See NAUTICAL ALMANAC.

EQUATIONS. An equation may be defined to be an algebraical sentence stating the equality of two algebraical expressions, or of an algebraical expression to zero. From another point of view, it is the algebraical expression of the conditions which connect known and unknown quantities. Thus (1), $xy = 24$, and (2), $x^2 + y^2 = 52$, are two equations expressing the relations between the unknown quantities x and y and known quantities. Generally, equations are formed from observations from which an object of inquiry may be inferred, but which do not directly touch the object. Thus, suppose we wish to ascertain the lengths of the sides of a rectangular board which we have no means of measuring, and that all the information we can get respecting it is, that it covers (say) 24 square feet, and that the square on its diagonal is (say) 52 square feet. From these facts, we can form equations from which we may determine the lengths of the sides. In the first place, we know that its area is equal to the product of its sides, and if we call these x and y, we have $xy = 24$, the first of the equations above given. Again, we know that the sum of the squares on the sides is equal to the square on the diagonal; hence, we have the second equation, $x^2 + y^2 = 52$. From these two equations, we should be able to determine the values of x and y. The determination of these values is called the *solution* of the equations.

Equations are of several kinds. Simple equations are those which contain the unknown quantity in the first degree; thus, $\frac{x}{2} + 3 = 4$, is a simple equation. Quadratic equations are those which contain the unknown quantity in the second degree: $x^2 + 5x - 36 = 0$, is a quadratic equation. Cubic and biquadratic equations involve the unknown in the third and fourth powers respectively. For the higher equations, there are no special names; they are said to be equations of the degree indicated by the highest power of the unknown which they contain. Simultaneous equations are those which involve two or more unknown quantities, and there must always be as many of them, in order to their determinate solution, as there are unknown quantities. The equations first mentioned—viz., $xy = 24 - x^2 + y^2 = 52$, are simultaneous equations. It may be mentioned, that in the course of solving such equations the principal difficulties encountered are always ultimately the same as in the solution of equations containing only one unknown quantity. For instance, in the equations just given, if we substitute in the second the value of y as given by the first, or $y = \frac{24}{x}$, we have $x^2 + \frac{(24)^2}{x^2} = 52$, which may be solved as a quadratic equation. The general theory of equations, then, is principally concerned with the solution of equations involving one unknown quantity only, for to this sort all others reduce themselves. Indeterminate equations are such as do not set forth sufficient relations between the unknown quantities for their absolute determination, and which accordingly admit of various solutions. Thus, $xy = 24$ is an indeterminate equation, which is satisfied by the values $x = 3, y = 8$; or $x = 6, y = 4$; or $x = 2, y = 12$. We require some other relation, such as $x^2 + y^2 = 52$, to enable us to fix on one of the sets of values, x and y, as those of x. For other kinds of equations, see EXPONENTIAL, FUNCTIONAL, and DIFFERENTIAL.

The object of all computation is the determination of numerical values for unknown quantities, by means of the relations which they bear to other quantities already known. The solution of equations, accordingly, or, in other words, the evolution of the unknown quantities involved in them, is the chief business of algebra. But so difficult is this business, that, except in the simple cases where the unknown quantity rises to no higher than the second degree, all the resources of algebra are as yet inadequate to effect the solution of equations in general and definite terms. For equations of the second degree, or quadratic equations, as they are called, there is a rigorous method of solution by a general formula; but as yet no such formula has been discovered for equations even of the third degree. It is true, that for equations of the third and fourth degrees general methods exist, which furnish formulas which express under a finite form the values of the roots. See CARDAN, and CUBIC EQUATIONS. But all such formulas are found to involve *imaginary* expressions, which, except in particular cases, make the actual computations impracticable till the formulas are developed in infinite series, and the imaginary terms disappear by mutually destroying one another. What is called Cardan's formula, for instance (and all others are reducible to it), is in this predicament whenever the values of the unknown quantity are all real; and accordingly, in nearly all such cases, the values are not obtainable from the formulæ directly, but from the infinite series of which they are the compact expression. But though such formulæ as Cardan's are useless for the purpose of numerical computation, the search for them has led to most of the truths which constitute the general theory of equations, and through which their *numerical solution* may be said to have been at last rendered effective and general. This method of numerical solution is a purely arithmetical process, performed upon the *numerical coefficients* of equations, and it is universally applicable, whatever the degree of the equation may be. With this method are connected the names of Budan, Fourier, Horner, and Sturm. We cannot here enter into an account of it; the reader should consult on the subject Young's *Theory and Solution of Algebraical Equations of the Higher Orders;* Peacock's *Treatise on Algebra;* and La Grange's work on *Numerical Solutions.*

The rules for the solution of the simpler forms of equations are to be found in all elementary text-books of algebra. It must suffice to notice here a few of the leading general properties of equations. By the roots of an equation are meant those values real or imaginary of the unknown which satisfy the equality; and it is a property of every equation to have as many roots and no more as there are units in its degree. Thus, a quadratic equation has two roots; a cubic equation, three; and a biquadratic, four. The quadratic equation $x^2 + 5x - 36 = 0$ has two roots; + 9 and − 4, which will be found to satisfy it. Further, the expression $x^2 + 5x - 36 = (x - 9)(x + 4) = 0$; and generally if the roots of an equation

$$F(x) = x^n \pm A_{n-1}x^{n-1} \pm A_{n-2}x^{n-2} \pm \dots$$
$$\pm A_1 x \pm A_0 = 0$$

(to which general form every equation of the *n*th degree can be reduced), are

$$\pm a_1 \pm a_2 \pm a_3 \dots \pm a_n \dots$$

then $(x \mp a_1)(x \mp a_2)(x \mp a_3) \dots$

$$(x \mp a_n) = F(x) = 0.$$

Hence, and from observing the way in which, in the multiplication of these factors, the coefficients

$$A_{n-1}, A_{n-2} \ldots A_1, A^0$$

are formed, we arrive at the following important results:

A_{n-1} = the sum of the roots, with their signs changed.

A_{n-2} = the sum of the products of every two roots, with their signs changed.

A_{n-3} = the sum of the products of every three roots, with their signs changed.

A_0 = the product of the roots, with their signs changed.

The factors, it will be observed, are formed thus: If $+a_1$ be a root, then $x = a_1$, and $x - a_1 = 0$ is the factor. If the root were $-a_1$, then $x = -a_1$; and the factor would be $x + a_1 = 0$. Observing now the way in which, in multiplying a series of such factors, the coefficients of the resulting polynomial are formed, we arrive at this: that a complete equation cannot have a greater number of positive roots than these *changes* of sign from + to − and from − to + in the series of terms forming its first member; and that it cannot have a greater number of negative roots than there are *permanencies* or repetitions of the same sign in proceeding from term to term. From the same source, many other general properties of equations, of value in their arithmetical solution, may be inferred. The subject is, however, too vast to be more than glanced at here.

EQUA'TOR, Celestial, is the great circle in the sky corresponding to the extension of the equator of the earth.

EQUATOR, Terrestrial, the great circle on the earth's surface dividing the earth into the northern and southern hemispheres, and half way between the poles.

EQUATO'RIAL, an important astronomical instrument, by which a celestial body may be observed at any point of its diurnal course. It consists of a telescope attached to a graduated circle, called the declination circle, whose axis penetrates at right angles that of another graduated circle called the hour circle, and is wholly supported by it. The pierced axis, which is called the principal axis of the instrument, turns on fixed supports; it is pointed to the pole of the heavens, and the hour circle is of course parallel to the equinoctial. In this position, it is easy to see that a great circle of the heavens corresponding to the declination circle, passes through the pole, and is an hour circle of the heavens. The telescope is capable of being moved in the plane of the declination circle. If, now, the instrument be so adjusted that the index of the declination circle must point to zero when an equatorial star is in the centre of the field of view of the telescope, and the index of the hour circle must point to zero when the telescope is in the meridian of the place, it is clear that when the telescope is directed to any star, the index of the declination circle will mark the declination of the star; and that on the other circle its right ascension. If the telescope be clamped when directed on a star, it is clear that, could the instrument be made to rotate on its principal axis with entire uniformity with the diurnal motion of the heavens, the star would always appear in the field of view. This motion of rotation is communicated to the instrument by clock-work.

EQUE'STRIAN ORDER, or **E'QUITES**. This body originally formed the cavalry of the Roman army, and is said to have been instituted by Romulus, who selected from the three principal Roman tribes 300 equites. This number was afterwards gradually increased to 3600, who were partly of patrician and partly of plebeian rank, and required to possess a certain amount of property. Each of these equites received a horse from the state; but about 403 B.C., a new body of equites began to make their appearance, who were obliged to furnish a horse at their own expense. These were probably wealthy *novi homines*, men of equestrian fortune, but not descended from the old equites (for it should be observed that the equestrian dignity was hereditary). Until 123 B.C., the equites were exclusively a military body; but in that year Caius Gracchus carried a measure, by which all the *judices* had to be selected from them. Now, for the first time, they became a distinct order or class in the state, and were called *Ordo Equestris.* In 70 B.C., Sulla deprived them of this privilege; but their power did not then decrease, as the forming of the public revenues appears to have fallen into their hands. After the conspiracy of Catiline, the equestrian order, which on that memorable occasion had vigorously supported the Consul Cicero, began to be looked upon as a third estate in the Republic; and to the title of *Senatus Populusque Romanus* was added *et Equestris Ordo.* But, even in the beginning of the empire, the honour, like many others, was so indiscriminately and profusely conferred, that it fell into contempt, and the body gradually became extinct. As early as the later wars of the Republic, the equites had ceased to constitute the common soldiers of the Roman cavalry, and figure only as officers.

EQUESTRIAN STATUE, the representation of a man on horseback. Equestrian statues were awarded as a high honour to military commanders and persons of distinction in Rome, and latterly were, for the most part, restricted to the emperors, the most famous in existence being that of the Emperor Marcus Aurelius, which now stands in the Piazza of the Capitol at Rome. It is the only ancient equestrian statue in bronze that has been preserved; an exemption which it probably owed to the fact, that for centuries it was supposed to be a statue of Constantine. The action of the horse is so fine, and the air of motion so successfully given to it, that Michael Angelo is said to have called out to it 'Cammina!'—(Go on, then!). It was originally gilt, and traces of the gilding are still visible on the horse's head. So highly is this statue prized, not only for its artistic but its historical value, that an officer used regularly to be appointed by the Roman government to take care of it, under the designation of the Custode del Cavallo. On the occasion of the rejoicings by which Rienzi's elevation to the tribuneship was celebrated in 1347, wine was made to run out of one nostril and water out of the other of this famous horse. The statue then stood in front of the Church of St John Lateran, near to which it was found, and a bunch of flowers has always been presented annually to the chapter of that basilica, in acknowledgment of ownership, since it was removed to its present site on the Capitol. All European capitals are adorned, or disfigured, by numerous equestrian statues, London belonging pre-eminently to the latter category.

EQUE'STRIANISM. See Horsemanship.

EQUIA'NGULAR, having equal angles. A figure is said to be equiangular all whose angles are equal to one another, as a square, or any regular polygon. Also triangles and other figures are said to be equiangular one with another whose corresponding angles are equal.

EQUIDÆ, or **SOLIDUNGULA** (Lat. solid-hoofed), a family of mammalia of the order *Pachydermata*, containing only a small number of species, which so nearly resemble each other that almost all naturalists agree in referring them to one genus, *Equus*. They are distinguished from all other quadrupeds by the complete consolidation of the bones of the toes, or the extraordinary development of one toe alone in each foot, with only one set of phalangeal and of metacarpal or metatarsal bones, and the extremity covered by a single undivided hoof. There are, however, two small protuberances (*splint bones*) on each side of the metacarpal or metatarsal bone (*canon* or *cannon bone*), which represent other toes. The E. have six incisors in each jaw, and six molars on each side in each jaw; the males have also two small canine teeth in the upper jaw, sometimes in both jaws, which are almost always wanting in the females. The molars of the E. have square crowns, and are marked by laminæ of enamel with ridges forming four crescents. There is a wide space between the canine teeth and the molars. The stomach of the E. is simple, but the intestines are long, and the cæcum extremely large; the digestive organs being thus very different from those of the ruminants, but exhibiting an equally perfect adaptation to the same kind of not easily assimilated food. Another distinctive peculiarity of the E. is, that the females have two teats situated on the pubes, between the thighs. But notwithstanding these characters, so dissimilar to those of the ruminants, they approach them very much in their general conformation, and may be regarded as a connecting link between pachyderms and ruminants. The largely developed and flexible upper lip is a character which belongs to the former rather than to the latter order.

The E. are now found in a truly wild state only in Asia and Africa. Fossil remains exist in the newer geological formations in great abundance in many parts of the Old World; very sparingly, however, in the New, although the bones of a peculiar and distinct species (*Equus curvidens*), belonging to the Pleiocene period, have been found in South America.

The horse and the ass are by far the most important species of this family. The dziggethai has also been domesticated and made useful to man. Of the other species, the zebra, quagga, and dauw, it is generally believed that they are incapable of useful domestication.

EQUILA'TERAL, having equal sides. A square is equilateral. The equilateral hyperbola is that whose axes and conjugate diameters are equal.

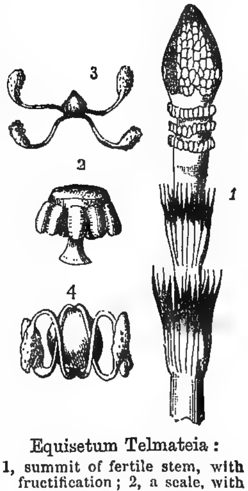
EQUILI'BRIUM, the state of rest or balance of a body or system, solid or fluid, acted upon by various forces. See STATICS and HYDROSTATICS.

EQUINO'CTIAL is the same with the celestial equator. See EQUATOR, CELESTIAL. The equinoctial points are those in which the equinoctial and the ecliptic intersect. See ECLIPTIC. Equinoctial time is time reckoned from the moment when the point of Aries passes the Vernal Equinox. See EQUINOXES. This instant is selected as a convenient central point of a uniform reckoning of time for the purposes of astronomical observers.

E'QUINOXES. Sometimes the Equinoctial Points (see EQUINOCTIAL) are called the equinoxes. More commonly, by the equinoxes are meant the times when the sun enters those points, viz., 21st March and 22d September, the former being called the Vernal or Spring Equinox, and the latter the Autumnal. When in the equinoxes, the sun, through the earth's rotation on its axis, seems to describe the circle of the equator in the heavens, and the days and nights are of equal length all over the world. At the vernal equinox, the sun is passing from south to north, and in the northern hemisphere the days are lengthening; at the autumnal, he is passing from north to south, and the days are shortening. As the earth moves more rapidly when near the sun, or in winter, the sun's apparent motion is not uniform, and it happens that he takes eight days more to pass from the vernal to the autumnal equinox, than from the latter to the former. The equinoctial points are not stationary. See ECLIPTIC.

EQUI'PMENT, E'QUIPAGE, in Military matters, are names given to certain of the necessaries for officers and soldiers. During the Crimean War, many officers applied for and obtained money as compensation for the loss or injury of their equipment, comprising horses, horse-appointments, baggage, saddlery, and accoutrements. Equipments issued to private soldiers are expected to last a certain number of years, and small deductions from their pay are made in the event of the articles not lasting the proper time. In those cases (in the English army) where a non-commissioned officer receives a commission on the ground of meritorious service, an allowance of £100, if in the infantry, or £150, if in the cavalry, is made to him to provide an equipment. The equipment of a private soldier is often used as a name for the whole of his clothes, arms, and accoutrements collectively. The *equipage* of an army is of two kinds: it includes all the furniture of the camp, such as tents and utensils, under the name of *camp-equipage;* while *field-equipage* comprises saddle-horses, baggage-horses, and baggage-wagons.

EQUISE'TUM, a genus of Cryptogamous plants, the structure and affinities of which are not yet well understood, but which many botanists regard as constituting a sub-order of ferns, whilst others prefer to make it a distinct order, *Equisetaceæ*. The English name HORSE-TAIL is often given to all the species. They have a leafless, cylindrical, hollow, and jointed stem, each joint terminating in a membranous and toothed sheath, which encloses the base of the one above it. The fructification is at the summit of the stem in spikes, which somewhat resembles trobiles (cones), and are formed of scales bearing spore-cases on their lower surface. The spores are minute, oval, or round, green, and each accompanied with four elastic and hygrometrical threads. These threads are sometimes called *elaters*, but it is by no means certain that they are of the same nature with the spiral filaments so called, which are mixed with the spores of many *Hepaticæ* (q. v.). Each thread terminates in a kind of club. The stems generally have lateral branches, angular, but otherwise similar in structure to the stem, growing in whorls from the joints; sometimes the stem is simple; or fertile stems are simple,



Equisetum Telmateia: 1, summit of fertile stem, with fructification; 2, a scale, with its stalk (lateral view); 3, a spore, with its filaments unrolled; 4, a spore, with its filaments hygrometrically rolled up.

and sterile stems are branched. The species of this genus contain a peculiar acid, called *Equisetic Acid.* Astringent and diuretic properties exist in these plants, and they were formerly used in medicine, but are not now regarded as of much value. It has been said that they are very injurious to cattle which eat them, but this seems to require confirmation. They abound chiefly in damp soils, and sometimes so much that the plough and harrow, or the grubber, must be employed to extirpate them. Some of them, however, grow in dry fields and gardens; whilst others are found chiefly in ditches or the banks of rivers. They exist in almost all parts of the world, and are seldom of large size, varying from a few inches to a few feet in height, but a comparatively gigantic species has recently been discovered in tropical America. The rough siliceous stems of some species are used for smoothing and polishing wood, particularly those of *E. hyemale,* which are imported into Britain in considerable quantities from Holland, under the name of DUTCH RUSHES. The stems of this species are unbranched, or a little branched only at the base. It is not uncommon in Britain, and is found also, rather sparingly, in North America. It has been proposed to cultivate it, as it grows well under trees, where few other plants would thrive. The stems of other species, as *E. arvense,* the most common of all the British species, are used for scouring tin and pewter vessels.

E'QUITABLE DEFE'NCES at common law were introduced by the Common Law Procedure Act (15 and 16 Vict. c. 76, s. 83), whereby it is enacted that the defendant in any cause, and the plaintiff in replevin, where he would be entitled to relief against the judgment on equitable grounds, may plead the facts which entitle him to such relief. The effect of this enactment has been to extend materially the equitable jurisdiction of common law courts, by enabling them to give effect to a plea in cases where, though courts of law had no remedy, a court of equity would have afforded *unconditional* relief. It has been remarked by Pollock, C. B., *Clarke* v. *Laurie* 26, *Law Jour.* Ex. 36, that 'it is an established rule now . . . . that no equitable plea shall be permitted, except in a case where the plea and decision, and judgment of the court upon it, will work out and complete all the equity that belongs to the matter to which the plea refers.' A defendant having pleaded an equitable defence at law, is not precluded from resorting to the Court of Chancery, although the common law court has full jurisdiction, and his plea is a bar to the action. *Evans* v. *Bremridge* 25, *Law Jour.* Ch. 102.

EQUITABLE ESTATES, estates the right to which, according to the strict rules of English common law, cannot be sustained, but which receive full effect in a court of equity. These estates are the Equity of Redemption (q. v.) which a mortgager has in his estate, subject to the mortgage, and the right of *cestui que trust* in a trust estate. Formerly, these interests were not even recognised by courts of law; but by 7 Geo. II. c. 20, and 15 and 16 Vict. c. 76, courts of law are now empowered to take notice, and give effect to an equitable interest, where it appears that that interest is clear and free from question.

EQUITABLE MO'RTGAGE is where a person, having an equitable interest in an estate, mortgages that interest. Thus, a *cestui que trust* may mortgage his estate under the trust, or a mortgager, who has already mortgaged his estate, may convey his Equity of Redemption (q. v.) in security of his debt. In these instances, the interest operated upon being purely equitable, the transaction is an equitable mortgage. An equitable mortgage may also be effected by a deposit of title-deeds in security of debt. See MORTGAGE, ESTATE.

E'QUITY, COURTS OF, ENGLAND. The administration of justice in England is divided into two great branches, usually known as common law and equity. These terms serve sufficiently to indicate the character of the principles which regulate the practice in the several courts; for although within its own sphere the common law pays regard to equitable principles, yet it is in the equity courts that principles of equity have been matured into a separate science. The supreme courts of equity in England are the Lord Chancellor's Court, the Master of the Roll's Court, and the courts of the three Vice-chancellors. The origin of the separate equitable jurisdiction existing in England is to be found in the early adoption by the courts of common law of certain set forms for the redress of grievances, and their refusal to apply any remedy to cases which did not fall within those limits. Suitors finding that in numerous cases redress was not to be obtained in the ordinary legal tribunals, had recourse to the king as the fountain of justice, who, sitting in council, heard the complaints upon their merits without reference to the technicalities of law. As early as the reign of Edward I., the practice began to be adopted of delegating to the chancellor the petitions referred to the king. In this reign, an attempt was made to devise a method whereby the common law courts should be made the sole tribunal for the redress of grievances. By the statute of Westminster the second (13 Edw. I. c. 24), it was enacted that whenever a case occurred requiring a new writ, the Chancery (in which all suits took their rise) should frame a new writ to suit the case. This statute was never acted upon to the purpose intended; but in the reign of Edward III. its provisions were made use of by John Waltham, who was then chancellor, to introduce the writ of *Subpœna* (q. v.), returnable to Chancery only, whereby the Lord Chancellor's court was made the forum of a large class of causes. 'From this time,' says Mr Spence (*Chancery Jurisdiction,* i. 338), 'suits by petition or bill without any preliminary writ became a common course of procedure before the chancellor, as it had been in the council. On the petition or bill being presented, if the case called for extraordinary interference, a writ was issued by the command of the chancellor, but in the name of the king, by which the party complained against was summoned to appear before the Court of Chancery, to answer the complaint, and abide by the order of the court.' Thus was introduced into Chancery the practice of examining upon oath the party in the cause, a practice unknown at that time to common law. The cases heard in the Chancery courts were decided upon the principles of *honesty, equity,* and *conscience.* The next step which tended to widen the equitable jurisdiction of the Chancery courts, was the exclusion of the Roman law from the courts of common law. This was effected by a prohibition of the judges in the reign of Richard II. One result of this prohibition was to exclude altogether from the common law courts the question of trusts. There can be little doubt that the common law judges had this aim in view in the course which they adopted. Trusts were repugnant to the feudal law, the principles of which were acted upon in the common law courts. The Court of Chancery at once proceeded to give a remedy in this class of cases, which has ever since formed the most important branch of the equitable jurisdiction of that court. The jurisdiction of the Court of Chancery in matters of fraud, which also forms an important branch of the equitable jurisdiction of the court, is to be traced to the abolition of the Star Chamber

(q. v.) in the reign of Charles I. Thus has sprung up in England the equitable jurisdiction of the Court of Chancery. Owing its existence to the jealousy and exclusiveness of the common law, which adhered to ancient customs and feudal usages, it has not inaptly received the title of Equity. It is equitable inasmuch as it applied a measure of justice inaccessible by the ordinary procedure; and equitable in the principles administered, which had reference to the broad question of right unfettered by the technicalities of law. Yet is it a great error to suppose that the system administered in courts of equity is an arbitrary one at the pleasure of the presiding judge. Such probably was the case on the first introduction of such a tribunal; but as time progressed, the decisions of previous judges formed precedents for their successors, and the precepts of the Roman law were early adopted as a code for the regulation of the courts. The independent existence of the equity courts in England has called forth the animadversion of other nations. A practice directly opposed to that pursued in nearly every other civilised state could hardly fail to occasion such a result. The inconvenience occasioned to suitors by the necessity of seeking in different courts the remedy for civil injuries, and the alleged confusion of judicatories, have been strongly dwelt upon by the enemies of this system. Yet are these evils more imaginary than real. The relative jurisdictions of common law and equity are now so clearly defined as to leave a suitor little doubt in which court to seek his remedy. In place of opposing jurisdictions, the courts of common law and equity are rather independent tribunals established each for administering a separate branch of a judicial system. On the other hand, it is contended by English lawyers, and not without good reason, that by the existence of the English equity courts as an independent tribunal, a system of equity has been gradually evolved and established as fixed and certain in its principles as a code of laws, and one which is frequently resorted to for guidance by foreign tribunals. The popular delusion, that equity courts administer an arbitrary system repugnant to law cannot be too strongly controverted. This point has been dwelt upon by all writers on equity, yet is the error constantly repeated in every popular treatise. It must be remembered that the equity jurisdiction arose as ancillary to the law; not to contradict or overrule legal principles, but to remedy their defects. Mr Justice Story (*Principles of Equity Jurisprudence*, s. 49) remarks, that equity 'was principally applied to remedy defects in common law procedure, and therefore that equity jurisdiction was maintained on the same ground which now constitutes the principal cause of its interference—viz., that a wrong is done for which there is no plain adequate and complete remedy in the courts of common law.' The jurisdiction of the equity courts is divided under three principal heads—exclusive, concurrent, and assistant. The first consists almost entirely of the administration of trusts; the second comprises questions of fraud, of account, and also, it is said (Smith's *Principles of Equity*, 217), of specific performance of agreements. This matter appears, however, to fall more naturally under the assistant jurisdiction. In order to appreciate the domain of the equity courts, it must be borne in mind that common law confines its remedy usually to the awarding of damages, and to the pronouncing a judgment absolutely in favour of either plaintiff or defendant; equity, on the other hand, alone goes into all the merits of the case, and will deliver a modified judgment where circumstances demand it. The judges of the equity courts at present consist of the Lord Chancellor, two Lords Justices of Appeal, the Master of the Rolls, and three Vice-Chancellors. Until 1813, almost the whole business of the court was discharged by the Lord Chancellor. By 53 Geo. III. c. 24, a Vice-Chancellor of England was appointed; in 1833 (3 and 4 Will. IV. c. 49), the Master of the Rolls was required to hear motions, &c.; and in 1841, two additional Vice-Chancellors were appointed. The Lords Justices of Appeal were created in 1851. The ordinary business of the equity courts is transacted by the Master of the Rolls and the three Vice-Chancellors. The Lord Chancellor also may hear causes in the first instance, but he is most usually engaged in hearing appeals. The Lord Chancellor and the Lords Justices constitute the court of appeal. Appeals may be heard either by the Lord Chancellor alone, by the Chancellor and one of the Lords Justices, or by the two Lords Justices. From this court a further appeal lies to the House of Lords.

EQUITY, Principles of, in their widest sense, are the principles of eternal justice, of which all human laws are but adaptations. 'Equity,' says Lord Stair (i. 1. s. 17), 'is the body of the law, and the statutes of men are but as the ornaments and vestiture thereof.' In this sense, equity coincides with the Roman precepts of law—'honestè vivere, alterum non lædere, suum cuique tribuere'—(*Inst.* i. 1, s. 3), and with the principles of justice as laid down by the inspired writer—'to do justly, to love mercy, and to walk humbly with thy God.'—Micah, vi. 8. As the object of human law is to give expression to these principles, equity is thus the basis of law. But it is impossible, in the nature of things, that any code of laws should provide a remedy suited to every particular case; it has, therefore, been found necessary in every civilised nation, to establish some form of authority which should control the rigour and remedy the deficiency of positive law. Thus, it is the function of the law to lay down a code of rules whereby the rights of property and the transactions of commerce shall be regulated; but by the diversities of life it happens that various circumstances will occur to cause these fixed rules to operate harshly or unjustly in particular cases. A party may complain that a contract duly entered into with all legal formalities has been obtained by fraud; the owner of an estate is incapable from infancy or lunacy of managing his affairs; a person ostensibly the owner of large property is found to be placed in possession in trust only for the benefit of others. In these and many other cases, the party who, in compliance with every rule of the law, is in possession, is not in fact the person who should in justice exercise the right. Here equity steps in. While, then, all law may be said to be equitable, inasmuch as it is the purpose of law to dispense justice, yet, in the technical sense, the term equity is confined to those cases not specially provided for by positive law. But, on the other hand, experience has shewn that it would be most inconvenient, and subversive of order, if equity should arbitrarily interpose to remedy every apparent grievance, and therefore it is that the operation of equity is checked within certain limits. 'There are many cases against natural justice which are left wholly to the conscience of the party, and are without any redress, equitable or legal; and so far from a court of equity supplying universally the defects of positive legislation, it is governed by the same rules of interpretation as a court of common law, and is often compelled to stop where common law stops. It is the duty of every court of justice, whether of law or of equity, to consult the intention of the legislature.'—Story, *Principles of Equity*, s. 14.

Hence arises the maxim, that 'equity follows the law.' The principles of equity, therefore, as understood in modern times, may be said to be those principles of natural justice which are permitted to modify the rigour of positive law. In applying these principles to practice, the equitable jurisdiction has been intrusted by all nations, with the exception of England (see Equity Courts), to the same courts in which the positive law was administered. But in the infancy of states, the boundaries of law and equity, and the functions of the equity judge, were not so clearly defined as in the present day. By the Roman law, a power, called the *jus honorarium* or *nobile officium*, was reposed in the prætor of controlling on equitable grounds the decisions of the ordinary tribunals.* Each prætor, on entering upon his office, published an edict declaring the principles by which he would be guided in discharging his duty as an equitable magistrate. The principles so declared were binding on the prætor during his year of office, but not on his successor. There can, however, be little doubt that in process of time a system of equity was gradually evolved; and ultimately, in the reign of the Emperor Hadrian, the edicts of the prætors were collected by a civilian named Julianus, and embodied in a single code called the Perpetual Edict (q. v.). According to the practice of modern nations, the courts of law are accustomed to exercise a certain equitable jurisdiction whereby, within prescribed limits, the rules of law may be modified. In Scotland, the equitable power of the Court of Session is called the *Nobile Officium* (q. v.).

EQUITY OF REDEMPTION, the interest which a mortgager has in an estate which he has mortgaged. An equity of redemption may be devised, granted, or entailed, and the course of descent to an equity of redemption is governed by the same laws as the descent to the land would have been. Formerly, the equitable interest of a mortgager could not be recognised in a court of law, but by 7 Geo. II. c. 20, it is provided that where no suit is pending in a court of equity, either for foreclosure or redemption, but the mortgagee attempts to obtain possession by bringing an action of ejectment, in such a case, the court may restore his estate to the mortgager, on his payment of the principal and interest due on such mortgage.

EQUI'VALENTS, in Chemistry. See Atomic Weights, or Chemical Equivalents.

E'RA. See Chronology.

ERA'SED and **ERA'DICATED**, heraldically signifies that an object is plucked or torn off, and shewing a ragged edge; as opposed to *coupé* or *coupy*, cut, which shews a smooth edge. A tree plucked up by the roots is said to be eradicated.

Erased.

ERASI'STRATUS, one of the most famous physicians and anatomists of ancient times, flourished in the 3d c. B.C., and is supposed to have been born at Iulis, in the island of Ceos. He resided for some time at the court of Seleucus Nicator, king of Syria, and while there, acquired great renown by discovering and curing the disease of the king's eldest son, who was pining for the love of the young and beautiful Stratonice, whom his father in his old age had married. Afterwards, E. lived for some time at Alexandria, where, giving up practice, he devoted himself with great energy and success to his anatomical studies. The date of his death, which seems to have taken place in Asia Minor, is not known. He founded a school of medicine, wrote several works on anatomy—in which branch he was most celebrated—on practical medicine, and pharmacy. He believed that the heart was the origin both of the veins and arteries, and, had it not been his conviction that the arteries contained *air* instead of *blood*, little doubt is entertained but that he would have anticipated Harvey in the discovery of the circulation of the blood. Of his numerous writings only some obscure fragments and titles have been preserved. Compare Hieronymus, *Erasistrati et Erasistrateorum Historia* (Jena, 1790).

ERA'SMUS, Desiderius, one of the most vigorous promoters of the Reformation, was born at Rotterdam, 28th October 1467. He was the illegitimate son of a Dutchman named Gheraerd, or Garrit, by the daughter of a physician. In accordance with the fashion among scholars of his time, he changed the name Gheraerd into its Latin and Greek equivalents Desiderius Erasmus (more correctly, Erasmius)—meaning desired, loved. Till his ninth year, E. was a chorister in the cathedral at Utrecht. He was then sent to school at Deventer, where his talents began to display themselves in so brilliant a manner, that it was even then predicted that he would one day be the most learned man of his time. After the death of his parents, whom he lost at the age of fourteen, his guardians determined on bringing him up to a religious life, and—with the intention, it is said, of sharing his small patrimony among themselves—in his 17th year, placed him in the monastery of Emaus, near Gouda. From this constrained manner of life, however, he was released by the Bishop of Cambray. After having taken priest's orders in 1492, he went to Paris, to perfect himself in theology and the humane sciences. Here he supported himself in a somewhat precarious manner, by giving private lectures, and in 1497, accompanied some Englishmen, who had been his pupils, to England, where he was well received by the king. He, however, soon returned to Paris, and in 1506, to enrich his knowledge, visited Italy. At Turin, he took the degree of D.D. Shortly after, he applied to the pope for a dispensation from his monastic vows, which was granted. During the course of his journey, he visited Venice, Parma, Rome, and other interesting cities, in company with his pupil, Alexander Stuart, a natural son of James IV. of Scotland, who, along with his father, was afterwards slain at the battle of Flodden. At Rome, the most brilliant prospects were held out to him. Cardinal Grimani, a famous lover of learning in that day, offered, out of his admiration for E., to make him 'partaker of his house and fortunes.' Other eminent men vied with Grimani in shewing respect to the young scholar, among whom may be mentioned John de Medicis, afterwards Leo X., Cardinal Raphäel of St George, and Giles of Viterbo, general of the Augustines. The pope (Julius II.) also offered him a place among his penitentiaries, an office of considerable consequence, and it would appear, a 'step to the highest preferments in that court.' E., who had always an eye to the main chance, regretted, at a later period of his life, that he had not accepted the offers held out to him in Rome, but meanwhile, having pledged himself to return to England, where also he had many friends, he set out for that country in 1509, after the accession of Henry VIII. In several of the cities through which he passed he met with friends and patrons, who wished him to settle amongst them, but as Henry was a correspondent of his, E. was induced to cherish the highest hopes of personal favour from that monarch, and could not be prevailed on to stay for more than a very brief period. He had no sooner, however, arrived in England than he found out his mistake. At first, he lodged with Sir Thomas More, and during his stay with him composed his *Encomium Moriæ*, or Praise of Folly, the purpose of which is to expose all kinds of fools, but especially those who flourished in the church, not sparing the pope himself. For a short time he filled the office of Professor of Greek at Oxford, but on the whole was very scantily supplied with the means of subsistence. In 1514, he returned disappointed to the continent, and resided chiefly at Basel, where he died, 12th July 1536. E.'s extensive and profound learning was equalled by his refined taste and brilliant wit. A natural love of independence and quiet made him prefer a life of learned leisure and retirement to one of greater publicity; nevertheless, the readiness with which he assumed the character of an adroit man of the world, brought upon him the hostility of many of the nobler spirits of his time. He was no hero, and he knew it. He frankly confesses that 'he had no inclination to die for the sake of the truth.' Luther, in whom the soul and courage of the Apostle Paul seemed to be revived, overwhelmed him with reproaches for his cowardice in regard to the Reformation. But we must not forget that E. by his mental constitution was averse to enthusiasm. He was a scholar and a critic, not a preacher or iconoclast, and he was at least honest enough to abstain from denouncing the opinions of Luther, though he disapproved strongly of his violent language. Besides, there was a tincture of rationalism in the great Dutchman, which probably helped to chill his love of *mere Lutheranism.* But his services in the cause of science were great and lasting, and his writings are still esteemed for the importance of the subjects treated of, and their classical style. Besides editing several of the ancient authors, and various philological and theological writings, he prepared the earliest edition of the Greek Testament, which appeared at Basel in 1516. This is reckoned by some his greatest work. Michaelis says that perhaps there never existed an abler editor of the New Testament, and that E. possessed in the highest degree natural abilities, profound learning, a readiness in detecting errors, with every qualification that is requisite to produce critical sagacity. His best known work, however, is his *Colloquia*, a master-piece. Of all his writings, this has exercised the greatest influence. The first edition appeared in 1522, but did not please E., who issued a second during the same year. A third appeared in 1524. This book, which was meant, according to Erasmus, only to make youths better Latinists and better men, was condemned by the Sorbonne, prohibited in France, and burned in Spain. No one who takes up the book will wonder at its condemnation. It contains the most virulent and satirical onslaughts on monks, cloister-life, festivals, pilgrimages, &c., but it is disfigured by lewd and unchaste passages, which are wholly inexcusable. The work has been translated into almost all the modern languages. His *Encomium Moriæ*, or Praise of Folly, has been already mentioned. It was published in the original, with a German translation, and illustrations by Holbein, by W. G. Becker (Basel, 1780). E. himself superintended an edition of his works, published by Frobenius in Basel. The most complete edition is that of Leclerc (10 vols., Leyden, 1603—1606). The life of E. has been written in French by Burigny (2 vols., Paris, 1758), in German by Müller (Hamburg, 1828), and in English by Knight (Cambridge, 1726).

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* This function of the prætor commenced in the earliest times under the kings of Rome, and continued to attach to the office through all the changes which distracted the nation.

ERA'STUS, THOMAS, a learned physician and theologian, was born at Baden in Switzerland, 7th September 1524. His real name was *Lieber*, which, according to the fashion of his times, he translated into Greek. In 1540, he went to the university of Basel, where he studied divinity, philosophy, and literature. He subsequently visited Italy, where he betook himself to medicine, and obtained the degree of M.D. from the university of Bologna. After an absence of nine years, he returned to his own country, and lived for some time at the court of the princes of Henneberg, where he acquired a great reputation as a medical practitioner. The elector palatine, Frederick III., now invited him to his court, and appointed him first physician and counsellor of state. He also conferred on him the chair of physic in the university of Heidelberg. In 1581, he was selected to fill a similar office at Basel, where he died, December 31, 1583, after establishing a liberal foundation for the provision and education of poor students in medicine, which was long called the *Erastian foundation.* Among E.'s medical works may be mentioned his *Disputationum de Medicina Nova Philippi Paracelsi* (Basel, 1572—1573), *Theses de Contagio* (Heidelberg, 1574), and *De Occult. Pharmaco. Potestatibus* (Heidelberg, 1574). As a physician, E. is creditably characterised by his distrust of abstract and *à priori* theorising, and his conviction that experimental investigation is the only road to knowledge. But his fame now rests chiefly on what he wrote in ecclesiastical controversy. In his book *De Cœna Domini*, he contended for the figurative interpretation of the passage, 'This is my body,' &c., and supported this view at the conference held at Maulbron between the divines of the Palatinate and those of Wittenberg. But his great work is his *Explicatio Quæstionis Gravissimæ de Excommunicatione.* Although this work was not published till some years after his death, E. had published the same opinions as it contains in the form of theses, directed against Gaspar Olevianus, a refugee from Treves, and various other persons, who were anxious to confer on ecclesiastical tribunals the power of punishing vices and misdemeanours. E. denied the right of the church to excommunicate, exclude, absolve, censure—in short, to exercise discipline. Denying 'the power of the keys,' he compared a pastor to a professor of any science, who can merely instruct his students; he held that the ordinances of the gospel should be open and free to all, and that penalties being both in their nature and effect *civil* and not *spiritual*, ought to be inflicted only by the civil magistrate. E. formed no *sect*, neither did he wish to do so. His desire was, in fact, of an exactly contrary character—viz., to preserve an external harmony at the expense even of the purity of the visible church. He would have let the wheat and tares grow together until the end of the world. Many eminent men, especially in the Church of England, have shared similar opinions both before and after E., such as Cranmer, Redmayn, Cox, Whitgift, Lightfoot, Selden, &c. The term Erastian has long been a favourite epithet of reproach in Scotland, but has not been employed with any great precision. All persons who deny the power of an established church to alter her own laws without the consent of the state—as, for example, the law of patronage—are generally accused of *Erastianism*, although the principles of E. have literally nothing to do with such a question. An English translation of the *Explicatio* was published in 1669, and was re-edited by Dr Robert Lee of Edinburgh in 1845.

ERA'SURE, or **RA'ZURE** as it is more commonly called in England, from the Latin *rado*, to scrape or shave, is the scraping or shaving of a deed or other formal writing. In England, except in the case of a will, the presumption, in the absence of rebutting evidence, is that the erasure was made at or before execution.—Doe ex dem Tatham *v.* Gattamore, 17 L. T. Rep 74. 'If an alteration or erasure has been made in any instrument subsequent to its execution, that fact ought to be mentioned (in the Abstract, or epitome of the evidences of ownership), together with the circumstances under which it is done, and more particularly so as a fraudulent alteration by either of those means, if made by the person himself taking under it, would vitiate his interest altogether. It was formerly considered that an alteration, erasure, or interlineation (q. v.), would void the whole instrument, even in those cases where it was made by a stranger; but the law is now otherwise, as it is clearly settled that no alteration made by a stranger will prevent the contents of an instrument from retaining its original effect and operation, where it can be plainly shewn what that effect and operation actually was. To accomplish this, the mutilated instrument may be given in evidence as far as its contents appear; and intrinsic evidence will be admitted to shew what portions have been altered or erased, and also the words contained in such altered or erased parts; but if, for want of such evidence, or any deficiency or uncertainty arising out of it, the original contents of the instrument cannot be ascertained, then the old rule would become applicable, or, more correctly speaking, the mutilated instrument would become void for uncertainty.'—Hughes' *Practice of Conveyancing*, i. 124, 125. If a will contains any alterations or erasure, the attention of the witnesses ought to be directed to the particular parts in which each alteration occur, and they ought to place their initials in the margin opposite, before the will is executed, and to notice this having been done by a memorandum, added to the attestation clause at the end of the will (*Ib.* p. 945). See also 1 Vict. c. 26. In Scotland, the rule as to erasure is somewhat stricter than in England—the legal inference being that such alterations were made after execution. As to necessary or *bonâ fide* alterations which may be desired by the parties, corrections of clerical errors, and the like, after the deed is written out, but before signature, the rule in Scotland is, that 'the deed must shew that they have been advisedly adopted by the party; and this will be effected by mentioning them in the body of the writing. Thus, if some words are erased and others superinduced, you mention that the superinduced words were written on an erasure; if words are simply delete, that fact is noticed; if words are added, it ought to be on the margin, and such additions signed by the party, with his Christian name on one side, and his surname on the other; and such marginal addition must be noticed in the body of the writ, so as to specify the page on which it occurs, the writer of it, and that it is subscribed by the attesting witnesses.'—Menzies's *Lectures on Conveyancing*, p. 124. The Roman rule was, that the alterations should be made by the party himself, and a formal clause was introduced into their deeds to this effect, 'Lituras, inductiones, superinductiones, ipse feci.' As a general rule, alterations with the pen are in all cases to be preferred to erasure; and suspicion will be most effectually removed by not obliterating the words altered so completely as to conceal the nature of the correction. 'The worst kind of deletion,' says Lord Stair, 'is when the words deleted cannot be read (but if they are scored that they can be read, it will appear whether they be *de substantialibus*), for if they cannot be read, they will be esteemed to be such, unless the contrary appear by what precedes and follows, or that there be a marginal note, bearing the deletion, from such a word to such a word, to be of consent.

ERATO'STHENES, an eminent Greek writer, called, on account of his varied erudition, the *Philologist*, was born at Cyrene 276 B.C. Among his teachers were Lysanias the grammarian, and Callimachus the poet. By Ptolemy Euergetes, he was called to Alexandria to superintend his great library. Here he died of voluntary starvation, at the age of 80, having become blind, and wearied of life. As an astronomer, E. holds an eminent rank among ancient astronomers. He measured the obliquity of the ecliptic, and the result at which he arrived—viz., that it was 23° 51′ 20″—must be reckoned a very fair observation, considering the age in which he lived. Hipparchus used it, and so did the celebrated astronomer Ptolemy. An astronomical work which goes under the name of E., but which is certainly not his, is still extant, and is called *Katasterismoi;* it contains an account of the constellations, their fabulous history, and the stars in them. It is believed, however, that E. did draw up a catalogue of the fixed stars, amounting to 675; but it is lost. A letter to Ptolemy, king of Egypt, on the duplication of the cube, is the only complete writing of his that we possess. E.'s greatest claim to distinction, however, is as a geometer. In his attempt to measure the magnitude of the earth, he introduced the method which is used at the present day, and found the circumference of the earth to be 252,000 stadia; which, according to Pliny, is 31,500 Roman miles. But as it is not known *what* stadium E. used, it is possible that he came nearer the actual circumference than the above figures indicate. His work on geography must have been of great value in his times: it was the first truly scientific treatise on the subject. E. worked up into an organic whole the scattered information regarding places and countries related in the books of travels, &c., contained in the Alexandrian Library. He also wrote on moral philosophy, history, grammar, &c. His work on the Old Attic Comedy appears, from the remains which we possess, to have been a learned and very judicious performance. Such fragments of E.'s writings as are still extant have been collected by Bernhardy in his *Eratosthenica* (Berlin, 1822).

E'RBIUM (symbol E) is a rare metal, the compounds of which are found in a few scarce minerals, especially in *gadolinite*, obtained from Ytterby, in Sweden. In its compounds and properties it resembles the metal aluminium.

ERCI'LLA Y ZUÑIGA, ALONSO, a Spanish poet, was born at Madrid, August 7, 1533. He was the third son of a Spanish jurist, and at an early period became page to the Infanta Don Philip, son of Charles V., accompanying him on his journey through the Netherlands, and some parts of Germany and Italy, and in 1554, to England, on the occasion of the celebration of Philip's nuptials with Queen Mary. Shortly after, E. went with the army dispatched to America to quell the insurrection of the Auracanians on the coast of Chili. The difficulties with which the Spaniards had to contend, the heroism displayed by the natives in the unequal contest, and the multitude of gallant achievements by which this war was distinguished, suggested to E. the idea of making it the subject of an epic poem. He began his poem on the spot, about the year 1558, occasionally committing his verses, in the absence of paper, to pieces of leather. An unfounded suspicion of his having plotted an insurrection involved him in a painful trial, and he had actually ascended the scaffold before his innocence was proved. Deeply wounded, the brave soldier and poet turned to Spain, but Philip treating him with great coldness and neglect, E. made a tour through France, Italy, Germany, Bohemia, and Hungary. For some time he held the office of chamberlain to the emperor Rudolf II., but in 1580 returned to Madrid, where he in vain exerted himself to realise an independence. The latter years of his life were spent in obscurity and poverty at Madrid, where he died, at what period has not been ascertained. His historic epos, written in the octo-syllabic measure, and entitled *Araucana*, is, with the exception of a few episodes, a faithful description of actual events. Cervantes, in his *Don Quixote*, compares it with the best Italian epics, and it has undoubtedly not a little of the epic style and spirit. The first part is the freshest in character, having been completed before the author's return to Europe, where it was first published separately (Madrid, 1569). The second part appeared nine years later. In it, E. by the introduction of episodes, yielded more to the taste of the time; and this was still more the case in the third part, which was first published, along with the two others, in 1590. In Spain, and likewise in other countries, many reprints of the poem appeared (the most elegant, 2 vols., Madrid, 1776; the most accurate, 2 vols., Madrid, 1828). A continuation was published by Don Diego Santistevan Osorio, of Leon (Salamanca, 1597). A German translation has been published by Winterling (2 vols., Nuremberg, 1831).

E'REBUS—the name of one of the sons of Chaos—signifies darkness, and is used specially to denote the dark and gloomy cavern beneath the earth, through which the shades must pass in going to Hades.

ERE'CHTHEUS or **ERICHTHO'NIUS,** AND **ERECHTHE'UM.** Erechtheus, an Attic hero, is said to have been the son of Hephaestus and the Earth, and to have been reared by Athena. One form of the tradition states that when a child he was placed by Athena in a chest, which was intrusted to Agraulos, Pandrosos, and Herse, the daughters of Cecrops, with the strict charge that it was not to be opened. Agraulos and Herse, however, unable to restrain their curiosity, opened the chest, and discovering a child entwined with serpents, they were seized with madness, and threw themselves down the most precipitous part of the Acropolis. Afterwards Erechtheus was the chief means of establishing the worship of Athena in Attica. He is regarded as the founder of the Erechtheum, the temple of Athena Polias, guardian of the city. This original Erechtheum, which contained Erechtheus's tomb after his death, and which was called by his name, was burned by the Persians, but a new and magnificent temple was raised upon the same site—north of the Parthenon, and near the northern wall of the Acropolis—in the beginning of the 4th c. B.C. The second Erechtheum was a splendid structure of the Ionic order, of an oblong shape, extending from east to west, abutting in side chambers at the western end, towards the north and south, and having porticoes adorned with columns at its eastern, its northern, and southern extremities. It is now a complete ruin.

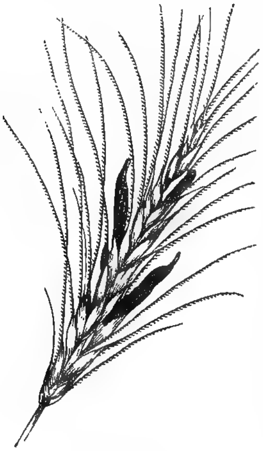
ERE'CTION, LORDS OF, those of the nobility in Scotland to whom the king, after the Reformation, granted lands, or tithes, which formerly belonged to the church. They were also called Titulars of Tithes; the gifts being by no means confined to the nobility. These titulars had the same rights to erected benefices, both in lands and tithes, which had formerly belonged to the monasteries and other religious houses. The grants were made under the burden of providing competent stipends to the reformed clergy—an obligation which was very little attended to by the grantees, prior to the decrees arbitral of Charles I., in 1629. Ersk. B. ii. tit. 10, s. 18.

EREMACAU'SIS (Gr. *ērema*, gently, and *kausis*, combustion) is a term originally proposed by Liebig to indicate the slow process of combustion at ordinary temperatures, which ensues when organic compounds, such as wood, are left exposed to the air, and gradually rot away or decay. The process consists in the oxygen (O) of the air combining with the hydrogen (H) of the wood forming water (HO), and in less quantity with the carbon (C) forming carbonic acid (CO_2), leaving a brown mould or powder, called by chemists ulmin, or humus, in which carbon preponderates.

E'RFURT, a town and fortress of Prussian Saxony, capital of old Thuringia, stands in a highly cultivated plain, on the right bank of the Gera, 14 miles west of Weimar. It is surrounded by walls, pierced by six gates, and is strengthened by two citadels, the Petersberg and the Cyriaksburg, both formerly monasteries. Among the numerous churches, the cathedral and the Church of St Severus are the finest. The cathedral is one of the most venerable Gothic buildings in Germany, and possesses, besides a very rich portal, sculptures dating from the 11th to the 16th century. Of the convents, only that of the Ursuline nuns remains. The monastery of St Augustine, famous as the residence of Luther, and in which his cell is still pointed out, was converted in the year 1820 into an asylum for deserted children. The other remarkable buildings are, the university, founded in 1378, and suppressed in 1816; the royal academy; the library, containing 50,000 volumes; numerous educational establishments, a hospital, two infirmaries, &c. Pop. 33,000. Horticulture, and an extensive trade in seeds, are carried on. The principal manufactures are woollen, silk, cotton, and linen goods, yarn, shoes, stockings, tobacco, leather, &c.

E. is said to have been founded in the beginning of the 5th c. by one Erpes, from whom it took its original name of Erpesford. During the middle ages, at the time of its highest prosperity, E. was strongly fortified, and contained 60,000 inhabitants. In 740, St Boniface founded a bishopric at E., and in the year 805 it was converted into an entrepôt of commerce by Charlemagne. It afterwards belonged to the Hanse-league, then to the elector of Mainz, from 1801—1806 to Prussia, and from that time until 1813 it was under French rule. E. was finally restored to Prussia by the Congress of Vienna. In the spring of 1850, the parliament of the states, which had combined together for union, held its sittings at Erfurt.

E'RGOT, a diseased condition of the germen of grasses, sometimes also observed in some of the *Cyperaceæ*. It begins to shew itself when the germen is young; different parts of the flower assume a mildewed appearance, and become covered with a white coating composed of a multitude of minute spore-like bodies mixed with delicate cobweb-like filaments; a sweet fluid, at first limpid, afterwards viscid and yellowish, is exuded; the anthers and stigmas become cemented together; the ovule swells till it greatly exceeds the size of the proper seed, bursts its integuments, and becomes elongated and frequently curved, often carries on its apex a cap formed of the agglutinated anthers and stigmas, and assumes a gray, brown, purple, violet, and at length a black colour, as the viscid exudation dries and hardens. The structure differs very much from that of the properly developed seed; the qualities are not less different, almost one-half of the whole substance consists of *fungin;* and the cells contain, instead of starch, globules of a peculiar fixed oil—OIL OF ERGOT, to which the remarkable qualities of ergot are supposed to be chiefly or entirely due. Oil of ergot forms about 35 per cent. of the ergot of rye. Ergot appears to have been first observed in rye, in which it becomes very conspicuous from the large size it attains, sometimes an inch or even an inch and a half in length. It is, however, not uncommon in wheat and barley, although in them it is not so conspicuous, from its general resemblance to the ordinary ripened grain. Rye-grass is often affected with ergot, as are many other grasses; and it is of frequent occurrence in maize, in which also it attains its greatest size. Ergot has been supposed to be merely a disease occasioned by wet seasons or other climatic causes. But it appears now to be fully ascertained, that it is a disease occasioned by the presence of the *mycelium* of a fungus; the spores of which may perhaps be carried to the flower through the juices of the plant, for there is reason to think that ergot in a field of grain may be produced by infected seed. Mr Quekett, in 1838, described a fungus, a kind of MOULD (q. v.), which he found in ergot, and to which he gave the name of *Ergotætia abortifaciens.* Link and Berkeley afterwards referred it to the genus *Oidium;* and they, as well as others, believed it to be the true ergot fungus. The spores of this ergot mould, however, vegetate readily, under proper conditions of warmth and moisture, in situations very different from that in which ergot is produced; and its presence is perhaps a consequence rather than the cause of ergot. The true ergot fungus seems to have been discovered by Tulasne, who published a description of it in 1853. That of the ergot of rye is called *Cordiceps* (or *Claviceps*) *purpurea;* its mycelium alone exists in ergot, but if the ergoted grains are sown, the fungus develops itself in its perfect form, growing in little tufts from the surface of the ergot, with stem about half an inch long, and subglobular head. Allied species appear to produce the ergot of other grasses.


Ergot of Rye.

Ergot is inflammable; the fixed oil which it contains, indeed, makes it burn readily if brought into contact with the flame of a candle. It is a valuable medicine, exercising a specific action on the womb, particularly during labour, and by the greater frequency and force of the contractions which it causes when cautiously administered, often most beneficially hastening delivery. Its employment for this purpose is said to have originated—in consequence, probably, of an accidental discovery—with a provincial female practitioner in France. Its introduction into British practice dates only from 1824. It is the ergot of rye which is always employed; also called SPURRED RYE, or *Secale cornutum.* It has been employed also as a sedative of the circulation, to check various kinds of hæmorrhage. Ergot is administered in various forms—powder, decoction, extract, tincture, oil of ergot, &c.—In large or frequent doses, ergot is a poison, sometimes producing convulsions, followed by death; sometimes gangrene of the extremities, resulting in mutilation or in death.

Ergot of rye consists of 35 per cent. of a peculiar fixed oil, $1\frac{1}{4}$ of ergotin, 46 of fungin, the remainder being gum, fat, albumen, salts, &c. Ergot burns with a yellow-white flame, and treated with water, yields a reddish coloured liquid with acid properties. In considerable quantities, it is a poison to the lower animals as well as to man.

E'RGOTISM, the constitutional effect of Ergot of Rye (q. v.). See also RAPHANIA.

E'RIC is the Scandinavian form of the name Henricus, Enrico, and Henry of southern nations. Many kings of the name reigned separately in Denmark and Sweden, and some ruled over the whole of Scandinavia after the union of Calmar. The memory of the two earliest rulers of the name in Denmark merits our notice from their association with the introduction of Christianity. Eric I., who died in 860, protected the Christians in the latter part of his reign, and, under the direction of the missionary Ansgar or Anscharius, founded the cathedral of Ribe, the first Christian church in the land. In his time, the Northmen began those incursions into more southern countries, which were destined to exercise so permanent an influence on European history. Eric II. followed in the steps of his father, and permitted Ansgar to prosecute the labour of converting and civilising the people, which won for him the title of the Tutelar Saint of the North. To Eric II. is ascribed the reorganisation of those guilds which finally merged in the municipal corporations of the middle ages, but which were, at first, a mere modification of the heathen brotherhoods of the Scandinavian heroic ages, and constituted associations, whose members were a privileged class, separated by distinct laws, rights, and duties from the rest of the people. Denmark suffered in the 12th c. in an equal degree from the two Erics who ruled over her, for while Eric, surnamed Emun, exhausted the strength of the land by the indomitable pertinacity with which he endeavoured, by force of arms, to compel the Vandals and other piratical neighbours to accept the Christianity which he thrust upon them, Eric 'the Lamb' crippled the powers and resources of the crown by his pusillanimous subserviency to the clergy. The three Erics (Eric VI., VII., and VIII.) who occupied the throne, with only the intermission of a few years, from 1241 to 1319, are associated with one of the most disastrous periods of Danish history. Long minorities, the suicidal practice of dismembering the crown-lands in favour of younger branches of the royal house, and futile attempts to restrain the ever-increasing encroachments of the church, combined to bring the country to the brink of destruction. Eric VI. (Plogpenning) and Eric VII. (Glipping) were both assassinated, the former at the instigation of a brother, and the latter in revenge for a private injury. Eric VIII., the last of the name before the union of Calmar, died childless, and was succeeded, in 1319, by his ambitious brother Christopher, who saw himself compelled to repay his partisans at the expense of almost all the prerogatives and appanages which still belonged to the crown.

In Sweden, the first of the name who merits our notice is King Eric, surnamed the Saint, who was slain in battle in 1161, after a short reign, which was signalised, in that age of anarchy, by the foundation of many churches and monasteries, and by the promulgation of an excellent code of laws, known as *St Eric's Lag*. This law contained provisions by which a higher status in society was secured to women, by granting them a fixed proportion of the heritage of their male relatives, and certain definite privileges within their households. St Eric waged frequent war with the Finns, and compelled them to adopt the outward forms of Christianity. The two namesakes and descendants of St Eric, who ruled in Sweden during the 13th c., and Eric XII., who reigned from 1350 to 1359, have little claim to our notice, for internal disturbances and wars with their neighbours brought about the same fatal results as those which are associated with the reigns of the Erics in Denmark during the middle ages. In 1412, on the death of the great Margaret, her relative, Eric of Pomerania, succeeded to the triple crown of Scandinavia, in accordance with the articles of the famous treaty of Calmar. The noble heritage that had been bequeathed to Eric required a firmer hand and a braver spirit than his to keep it in check; and his reckless disregard of treaties and oaths, his neglect of his duties, and his misdirected ambition, led, after years of dissensions, maladministration, and disaffection, to the inevitable result that Eric was declared to have forfeited the respective thrones of the several kingdoms, which proceeded to elect rulers of their own. The intestine wars to which this condition of things gave rise, plunged the whole of Scandinavia into anarchy, and sowed seeds of dissension among the three kindred nations, which bore fatal fruits in subsequent ages. The last ten years of Eric's life were spent in the exercise of piracy in the island of Gothland, whither he had retired with his mistress and a band of followers, and from whence he sent forth piratical expeditions to pillage both friends and foes. Eric married Philippa, daughter of Henry IV. of England, whose memory is still cherished in the north, on account of the many noble deeds with which local tradition associates her name. Eric XIV., the last of the name who reigned in Sweden, had the distinction of being at once one of the worst and one of the most unhappy of the name. He succeeded, in 1560, to the throne of his father, Gustaf Vasa, who was perhaps the greatest and worthiest monarch that ever reigned over Sweden, and immediately on his accession, he made known the difference that was so unfavourably to distinguish his reign from that of his father, by quarrelling with his brothers, thwarting the nobles, and opposing the lower orders. His fickleness and extravagance were displayed in a succession of embassies, which were in turn sent to almost every European court to demand a consort for this vacillating monarch, who usually changed his mind before his envoys had time to fulfil their missions. Elizabeth of England and Mary of Scotland were more than once the objects of his matrimonial schemes; but when the resources of the country had been seriously crippled by these costly and absurd expeditions, Eric married a Swedish peasant-girl, who ultimately acquired an influence over him which was ascribed by the superstitious to witchcraft, since she alone was able to control him in the violent paroxysms of blind fury to which he was subject. It is probable that Eric laboured under remittent attacks of insanity, and that to this cause may be attributed the blood-thirsty cruelty with which he persecuted those of his own relatives or attendants who fell under his suspicion. His capricious cruelties at length alienated the minds of his subjects, who, wearied with the continuous wars and disturbances in which his evil passions involved them, threw off their allegiance in 1568, and solemnly elected his brother John to the throne. For nine years, the unhappy Eric suffered every indignity at the hands of the keepers appointed by his brother to guard him, and in 1577, he was compelled to terminate his miserable existence by swallowing poison, in obedience to his brother's orders. Singular to say, this half madman was a person of cultivated understanding, and he solaced his captivity with music and the composition of psalms, and in keeping a voluminous journal.

ERI'CEÆ, or **ERICA'CEÆ**, a natural order of exogenous plants, consisting chiefly of small shrubs, but containing also some trees. The leaves are opposite or in whorls, entire, destitute of stipules, often small, generally evergreen and rigid. The flowers are sometimes solitary in the axils of the leaves, sometimes grouped in different modes of inflorescence, and are often of great beauty, in which respect no order of plants excels this; the beauty of the smallest species, and of those which have very small flowers, rivalling that of others which are trees profusely covered with magnificent clusters. About 900 species of this order are known, of which the greater number are natives of South Africa, which particularly abounds in the genus *Erica*, and its allies—the true Heaths (q. v.)—although some of them are also found to the utmost limits of northern vegetation. They are rare within the tropics, and only occur at considerable elevations. Few species are found in Australia. Many of the E. are *social* plants, and a single species sometimes covers great tracts, constituting their principal vegetation. This is most strikingly exemplified in the heaths of Europe and the North of Asia. Medicinal properties exist in some of the E., as the BEARBERRY (see ARBUTUS), and the GROUND LAUREL of North America (*Epigæa repens*), a popular remedy in the United States for affections of the bowels and urinary organs. Narcotic and poisonous qualities are of not unfrequent occurrence. See ANDROMEDA, AZALEA, KALMIA, LEDUM, RHODODENDRON. The berries of some species are edible (see ARBUTUS and GAULTHERIA), although none are much esteemed.—The RHODODENDREÆ have sometimes been regarded as a distinct order, but are generally considered a suborder of E., containing the genera *Rhododendron*, *Azalea*, *Kalmia*, *Ledum*, &c. The larger leaves and flowers, and generally also the larger plants of the order, belong to this suborder; which, however, contains also many small shrubs of subarctic and elevated mountainous regions.

E'RICHT or **E'RROCHT**, LOCH, lies in the north-west of Perthshire and south of Inverness-shire, in an uninhabited district, the wildest and most inaccessible in Scotland, amid the Grampian mountains. Its banks rise steeply from the water's edge. It is fourteen miles long and nearly one mile broad, and it extends in a south-west direction from near Dalwhinnie on the Dunkeld and Inverness road. By one outlet it joins Loch Rannoch, and by another it runs into Loch Lydoch, its waters ultimately reaching the Tay. Its surface is about 1500 feet above the sea, and it never freezes. In a cave at the south end of the loch, Prince Charles lay hid in 1746.

E'RICSSON, JOHN, a distinguished engineer, was born in Sweden in 1803. After serving for some time as an officer of engineers in the Swedish army, he removed in 1826 to England, and continued to occupy himself with improvements chiefly on steam machinery and its applications. It is to E. that steam navigation owes the Screw-propeller (q. v.). In 1839 he went to New York, United States, where he has lived since, and has brought out numerous mechanical inventions. His name is chiefly known in connection with efforts to substitute heated air for steam as a motive power. See Caloric Engine.

E'RIE, one of the five great lakes which empty themselves by the St Lawrence, separates Upper Canada on its left from Michigan, Ohio, Pennsylvania, and New York on its right. It is the most southern of the five, receiving at its south-western extremity the waters of Lakes Superior, Michigan, and Huron by the river Detroit, and discharging them at its north-east by the Niagara into Lake Ontario. With a length of 240 miles, E. has a breadth varying from 30 to nearly 60 miles, with an area of 9600 square miles. It is 16 feet below the Huron, and 322 and 555 respectively above the Ontario and the Atlantic. At its south-western extremity are several wooded and partly cultivated islands, the largest of which is about 14 miles in circumference. It is by far the shallowest of the five great lakes. Its mean depth is stated at 120 feet; and from this comparative shallowness and the consequent liability to a heavy ground-swell, as well as on account of the small number of good harbours, the navigation is peculiarly difficult and dangerous. The chief harbours on the south, or United States shore, besides the natural harbour of Erie itself or Presque Isle, are those of Cleveland, Sandusky City, and Toledo; and on the north or Canadian shore, Ports Dover, Burwell, and Stanley. Lake E. receives no rivers of any consequence. Its commercial importance, however, has been largely increased by art. It is connected by one canal with the Hudson, and by more than one with the Ohio; while, on the British side, it communicates with the Ontario by means of a still more available work, the ship-channel of the Welland. Its navigation generally closes in the beginning of December, and the lake remains more or less frozen till March or April. The annual value of its commerce is estimated at 200,000,000 dollars. In 1858, no fewer than 136 vessels were built at the American dockyards of the lake. On the Canadian side are 10 light-houses and beacons; on the American, 26. The fisheries are of little value. Lake E. was the scene of a naval engagement between the British and Americans, September 10, 1813, in which the latter were victorious.

ERIE, a port on the lake of its own name in the state of Pennsylvania, stands in lat. 42° 8′ N., and long. 80° 10′ W. Its harbour, one of the largest and best on the coast, is formed by an island of four miles in length, which, under the appellation of Presque Isle, still preserves the memory of its having been a peninsula. The belt of water, which is thus sheltered, is known as Presque Isle Bay, and forms a natural harbour for the city. It is now protected by a breakwater. It is about a mile in width, and varies in depth from 9 feet to 25. While much has been done to improve the natural advantages of its position, E. has been connected by means of a canal with the Beaver, a feeder of the Ohio; and this work, independently of its navigable facilities, affords extensive water-power to mills of different kinds. Being, moreover, the terminus of railways converging from every quarter but the north, the place has advanced rapidly in trade and population. The imports and exports amount to fully 5,000,000 dollars; and, by the census of 1860, the inhabitants were 9419, having been, in 1850, only 5850.

ERI'GENA, Joannes Scotus, a famous philosopher of the middle ages, was born probably in Ireland, and flourished during the 9th century. Very little is known regarding his history. He appears to have resided principally in France, at the court of Charles the Bald. In the controversies of his time, regarding predestination and transubstantiation, he took part. His philosophic opinions were those of a Neo-Platonist rather than of a scholastic. His love for the mystic doctrines of the old Alexandrian philosophers was shewn by his translation of the writings ascribed to Dionysius the Areopagite, which proved to be a well-spring of mysticism during the middle ages. E. held that God is the essential ground of all things, from whom all things emanate, and into whom they return again. Pantheism, therefore, lurks in his system. His principal work is *De Divisione Naturæ* (published by Gale, Oxford, 1681). One of its leading thoughts is the identity of philosophy and religion, when both are properly apprehended. E. uttered his opinions with great boldness, and he exhibited no less subtlety and strength of intellect in their defence. He expressed his contempt for theological dogmatism, and vindicated the authority of reason over all other authority. His words are: 'Authority is derived from reason, and not reason from authority; and when the former is not confirmed by the latter, it possesses no value.' Consult Hjort's *Joh. E. oder vom Ursprunge einer Christlichen Philosophie* (Copenh. 1823), Standenmayer's *Joh. E. und die Wissenschaft seiner Zeit* (Frankfurt, 1834), and Taillandier *Scot. E. et la Philosophie Scholastique* (Strasburg and Paris, 1843).

ERI'GERON, a genus of plants of the natural order *Compositæ*, suborder *Corymbiferæ*, having heads (flowers) of many florets, the florets of the ray numerous, in several rows, of a different colour from those of the disc. Two or three species are natives of Britain, the most common of which, *E. acris*, has a stem 16—18 inches high, narrow entire leaves, flower-stalks forming a kind of corymb, flowers with yellow disc and pale-blue ray. It has a powerful odour, which is said to keep away fleas, and the name Flea-bane is sometimes given to the plant. Its ashes contain about 5 per cent. of potash, for the sake of which it is sometimes collected and burned. *E. Philadelphicum*, a native of North America, with pale-purple ray, and a fetid smell, is valued in the United States as a diuretic.

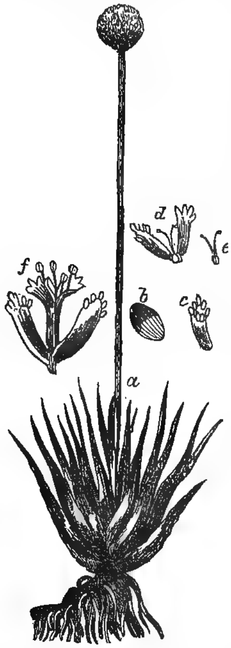
ERINA'CEUS and **ERINACE'ADÆ**. See Hedgehog.

ERI'NNA, a Greek poetess, concerning the date of whose birth the most different statements are advanced. According to some, she was the intimate friend of Sappho (hence she is likewise called the Lesbian singer), and was born at Rhodes, or on the little island of Telos, situated west of Rhodes; while others maintain that she lived in the age of Demosthenes; and others again, perplexed by such a wide difference in point of time, have recourse to the hypothesis of two poetesses of this name. E. acquired such celebrity by her epic, epigrammatic, and lyric poems, that her verses were compared with those of Homer, although she died at the early age of 19. The genuineness of the fragments that still exist under her name, has been disputed on good grounds. These have been collected by Schneidewin in the *Delectus Poesis Graecæ Elegiacæ* (Göttingen, 1838). Compare Malzow *De Erinnæ Lesbiæ vita et Reliquiis* (Petersburg, 1836).

ERIOBO'TRYA. See Loquat.

ERIOCAULA'CEÆ, a natural order of endogenous plants, nearly allied to *Restiaceæ*, and containing about 200 known species, many of which are aquatic or marsh plants. The E. are chiefly natives of the tropical parts of America and Australia. One species, *Eriocaulon septangulare*, Jointed Pipewort, is found in the west of Ireland, and in some of the

Hebrides; a little grass-like plant, growing in lakes which have a muddy bottom, and exhibiting small globular heads of flowers. From its botanical affinities, and with reference to geographical distribution, no British plant is more interesting. The E. form a remarkable feature of the vegetation of some parts of South America; but many of the species bear little resemblance to their humble northern congener, being almost shrubby, 4—6 feet high, with leafy, much-branched stems, 'each branchlet terminated by a large white ball, composed of a vast number of smaller heads, placed on peduncles of unequal length.' Many of them also grow on arid mountainous regions; others in flat sandy grounds, which are flooded in the wet season.—Gardner's *Travels in Brazil.*



Jointed Pipewort (*Eriocaulon septangulare*):

a, tuft of leaves, flower-stalk with flowers, and part of creeping root; *b*, seed; *c*, bract or scale; *d*, female flower; *e*, pistil; *f*, male flower.

ERIODE'NDRON, a genus of trees of the natural order *Sterculiaceæ*, natives of tropical countries, the thick woody capsules of which contain a kind of wool surrounding the seeds. These trees are therefore sometimes called Wool-trees. The wool of *E. Samanna* is used in Brazil for stuffing pillows. *E. anfractuosum*, of which one variety, found in the East Indies, is sometimes called *E. Indicum*, and another found in Africa, *E. Guineense*, is a tree of great height, 150 feet or more. The African variety or species is called Rimi and Bentang. Park mentions it by the latter name. Barth says it is generally to be seen growing near the principal gate of large towns in Hansa. Its wood is soft and spongy, chiefly used for making canoes. The seeds of *E. Indicum* are eaten in Celebes. They are roundish, and of the size of peas. The trees of this genus have palmate leaves. The flowers are large and beautiful.

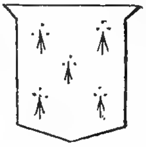
ERIWA'N (Persian, *Rewân*), the fortified capital of Russian Armenia, situated to the north of Ararat, in the elevated plain of Aras or Araxes, lat. 40° 10′ N., long. 44° 32′ E., 3312 feet above the level of the sea. It consists of the town, properly so called, and the fortress, which is surrounded on three sides by high walls, and provided with aqueducts; a stone bridge over the Zenga, which here falls into the Araxes; a barracks, three mosques, one of which has been converted into a Russian church, the palace of the Sardar, and a bazaar. Pop. (1854) 13,567, who are engaged in agriculture and commerce. E. was formerly the capital of the Persian province of Aran, celebrated for its silk. In the beginning of the 16th c., the khan Rewan, at the command of Ismael, the shah of Persia, erected a strong fortress, which he called after his own name. An Armenian school was established at E. in 1629, but transferred to Ejmiadzin in 1631. During the last war between Russia and Persia, E. was stormed by the Russian general, Paskewitsch, who received the surname of Eriwanski; and by the treaty of peace concluded at Turkmanjai, 22d February 1828, it was given up by Persia to Russia, along with the province of the same name. It is now an important Russian post, as in former times it formed the bulwark of Persia against the Turks, and afterwards against Russia. In the year 1840, it was much devastated by an earthquake.

E'RLANGEN, a town of Bavaria, is situated in the midst of a well cultivated district, on the right bank of the Regnitz, 10 miles north of Nürnburg. It is a handsome town, and is surrounded by walls pierced by seven gates; its streets—a great number of which were erected after the year 1706, when a fire consumed a large portion of the town—are straight and regular. It is divided into the Old and New Towns, the latter founded in 1686 by Christian, markgraf of Bayreuth. E. is the seat of a university, of a gymnasium, of agricultural and industrial schools, and other institutions. The university, however, is the chief building. It was founded in 1742, and is celebrated as a school of Protestant theology, is attended by between 400 and 500 students, has a library containing 100,000 vols. and 1000 manuscripts, and also zoological and mineralogical collections, &c. E. owes its prosperity to the migration thither of a number of refugees from France, who were compelled to flee on the revocation of the Edict of Nantes, and who introduced many new branches of manufacture at Erlangen. Besides its extensive stocking and glove manufactories, which provide the greater part of Germany with their goods, E. has great mirror and tobacco factories, and manufactures of combs and horn-ware. E. became a Bavarian possession by the treaty of 1809. Pop. 10,709.

E'RLAU (Hung. *Eger*), an episcopal city of Hungary, in the county of Heves, of which it is capital, is situated on both banks of the river Erlau, in a delightful valley skirted with vine-clad hills. It is surrounded by old walls, pierced by six gates; has four suburbs, in which the greater portion of the inhabitants dwell; and although in general its streets are narrow and have a neglected appearance, it is rich in fine public buildings. The principal of these are the Lyceum, with a valuable library, and an observatory 172 feet high; the recently built cathedral, the episcopal palace, the Franciscan and the Minorite monasteries, a richly embellished Greek church, a county hall, and the new barracks. E. has also a gymnasium, an episcopal seminary, a normal and drawing school, a hospital founded in 1730, which possesses a capital of nearly 400,000 guilders, and other important institutions. The two baths, the *Turkenbad* and the *Bischofsbad*, both of which are much resorted to during the bathing-season, are supplied from two warm springs which rise from the bank of the Erlau. The cultivation of the vine is the principal occupation of the inhabitants. The E. wine, the best red wine of Hungary, is produced in considerable quantities, and is in request even in foreign countries. There are also manufactures of linens, woollens, hats, &c., and an important weekly market, which has a beneficial effect upon the industry of the town. Pop. 16,900, most of whom are Roman Catholic in religion, and Magyar in race. E. owes its importance to the very old bishopric founded here by St Stephen in the beginning of the 11th c., and which, in 1804, was raised to an archbishopric.

ERLKÖNIG, in German, is the name applied to a poetical, personified, natural power which, according to German poetical authorities, prepares mischief and ruin for men, and especially for children, through delusive seductions. The name, not connected with the root *erle*, is synonymous with Elfen Konig. The E. was introduced into German poetry from the Sagas of the North, through Herder's translation of the *Erlkönig's Daughter* from the Danish, and has become universally known through Goethe's ballad of the *Erlkönig.*

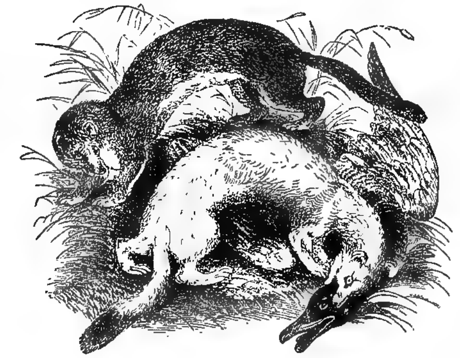
ERMENONVILLE, a village in the south-east of the department of Oise, in France, in the possession of the Girardin family. It is celebrated for its beautiful and extensive parks, and as being the resting-place of Rousseau, for which reason it is much visited in summer by strangers from Paris. It was also the residence of Gabrielle d'Estrées, the mistress of Henry IV., who inhabited a hunting-tower, part of which is still standing, and bears her name. It became still more celebrated after the death of Rousseau in 1778. During the revolution, his ashes were removed to the Pantheon, but conveyed back to E. after the restoration. It had nearly been purchased by the *Bande Noire*, but a larger sum was offered by Stanislaus de Girardin, the well known liberal deputy, and E. was preserved for the lovers of art, of nature, and of historical monuments.



Ermine.

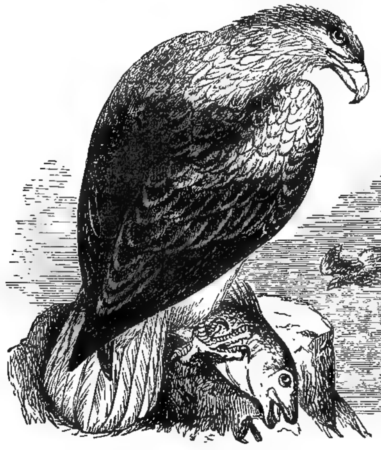
E'RMINE, white fur, with black spots; the reverse of which, or a black fur with white spots, also used in heraldry, is called *Contre Ermine.* Ermine is commonly used to difference the arms of any member of a family who is connected with the law. A cross composed of four ermine spots is said to be a Cross Ermine.

ERMINE, or **STOAT** (*Mustela erminea*), a species of Weasel (q. v.), considerably larger than the common weasel, but much resembling it in general form and other characters, as well as in habits. The E. is almost ten inches in length, exclusive of the tail, which is fully four inches and a half long. It is of a pale reddish-brown colour in summer, the under parts yellowish-white, the tip of the tail black: in winter—in cold countries or severe seasons—the upper parts change to a yellowish-white or almost pure white, the tip of the tail, however, *always* remaining black. This change takes place more frequently in the northern than in the southern parts of Britain, but sometimes even in the south of England; and when it is only partially accomplished, the animal presents a piebald appearance, and very often remains so during the milder winters of Britain. It is in its winter dress that it is called E., and yields a highly valued fur; more valuable, however, when obtained from the coldest northern regions than from more southern and temperate countries. In its summer dress it is called Stoat. It displays indomitable perseverance in the pursuit of its prey, which consists very much of rats, water-voles, and other such small quadrupeds; with young hares and rabbits, grouse, partridges, &c. The eggs of birds are as welcome to it as the birds themselves. The E. is a native of all the northern parts of the world. Its range extends even to the south of Europe. It delights in moorish districts, and is tolerably abundant in the north of Scotland. It is from Norway, Lapland, Siberia, and the Hudson's Bay territories that the E. skins of commerce are obtained, which are used not only for ladies' winter garments, but for the robes of kings and nobles, and for their crowns and coronets. E. has thus obtained a distinct recognition in heraldry. In making up E. fur, the tails are inserted in a regular manner, so that their rich black shall contrast with the pure white of the rest of the fur.



Ermine:
Summer and winter dress.

ERNE (*Haliæëtus*), a genus of birds of the family *Falconidæ*, and of the eagle group; differing from the true eagles in the greater length of the bill, in the toes and lower part of the tarsi being destitute of feathers, and generally, also, in frequenting the sea-coast and the banks of lakes and rivers to feed on fish, in feeding like vultures on carrion almost as readily as on newly killed prey, and in inferior courage. The only British species is the Common E. (*H. albicilla*), also known as the Sea Eagle or White-tailed Sea Eagle. It is much more common in Britain than the Golden Eagle, is sometimes seen even in the south of England and in inland districts, occasionally visiting deer-parks to prey on very young fawns or to devour dead deer; but is of more frequent occurrence in the north of Scotland, doing considerable injury to flocks in Sutherlandshire, particularly during the season of young lambs. Its favourite haunts, where it roosts and makes its nest, are the shelves and ledges of stupendous precipices on the coast, where its scream often mingles with the noise of the perpetual surge. It sometimes also breeds on crags beside inland lakes, as at the Lakes of Killarney, and more rarely even on trees. Fishes are certainly its favourite food, although its mode of procuring them is not well known; but water-fowl are also its very frequent prey. It is



Common Erne (*Haliæëtus albicilla*).

found in most parts of Europe, and even in the islands of the Mediterranean, but is more abundant in the north of Europe and in Siberia. It is not known as a native of America. In size, the E. is inferior to the Golden Eagle, being seldom more than 33 inches in its whole length. The general colour of the plumage is brown, the head having a paler yellowish tinge, the tail in the adult bird is pure white. The young, sometimes called the Cinereous Eagle, has a grayer plumage and mottled tail.—Another notable species of this genus is the White-headed E. (*H. leucocephalus*) of America, also called the White-headed Eagle, Bald Eagle, and Sea Eagle, the chosen symbol of the United States. It is a bird of about the same size with the Common E., with dark-brown plumage, and—in an adult state—the head, neck, tail, and belly white. It is found in almost all parts of North America, visiting the arctic regions in summer, but abounding chiefly in the southern states between the Atlantic and the Mississippi. It frequents both the sea-coast and the lakes and rivers, and may be often seen sailing through the column of spray at the Falls of Niagara. It is very fond of fish, which it procures by wading in shallow streams, and also by compelling the osprey to relinquish prey just taken. The soaring and evolutions of the birds in the air on such occasions are described as sublime. The White-headed E. feeds also on lambs, fawns, poultry, &c.; kills swans, geese, and other water-fowl; and does not disdain to compel vultures to disgorge for its use the carrion which they have swallowed. On account of its habits and dispositions, Franklin expressed his regret that it had been chosen as the symbol of his country.—More nearly resembling the Common E. is another North American species, the Bird of Washington (*H. Washingtonii*).—Australia produces a beautiful species (*H. leucogaster*), and numerous species are found in other parts of the world, amongst which are some of comparatively small size, as the Pondicherry Kite or Brahmany Kite (*H. ponticerianus*) of India, which is constantly to be seen fishing like a gull in the rivers of that country, and is by the Hindus considered sacred to Vishnu.

ERNE, a river and lake in the south-west of Ulster province, Ireland. The river rises in the south of Cavan county, in the small but beautiful Lough Cowna. It runs north and north-west, merging in Lough Oughter, in Cavan county, and in Lough Erne in Fermanagh county, and passes Enniskillen and Ballyshannon. It then flows through the south corner of Donegal county into Donegal Bay. It has a total course of 72 miles. On the river, at Ballyshannon, is a salmon-leap fall, over a rocky ledge 20 feet high and 150 yards broad, and the river leaps over another rocky ledge near Belleek, 2½ miles below the lower end of the loch. Lough Erne, one of the finest lochs in the kingdom, is the most attractive feature of Fermanagh county, which it bisects lengthways, and almost entirely drains. It extends 40 miles from south-east to north-west, and consists of two lakes, the upper and lower, joined by a narrower part 10 miles long, and assuming in parts the character of a river, with Enniskillen midway between the two lakes. The Upper Lough is 12 by 4 miles in extent, 10 to 75 feet deep, 151 feet above the sea, and has 90 green hilly islets. The Lower Lough is 20 by 7½ miles in extent, 100 to 266 feet deep, 148 feet above the sea, and has 109 similar islets. On one of the islets is a round tower. They contain salmon, trout, pike, bream, and eels. The scenery around is singularly varied and beautiful.

ERNE'STI, Joh. Aug., the founder of a new school of theology and philosophy, was born at Tennstädt, in Thüringia, 4th August 1707. He studied at Pforta, Wittenberg, and Leipsic; but after having been appointed rector of the Thomas-school in Leipsic, in 1734, turned his attention chiefly to the old classic literature, and the studies connected with it. In 1742, he became professor extraordinary of ancient literature in the university of Leipsic, in 1756 professor of rhetoric, in 1759 professor of theology, and died 11th September 1781. E. paved the way to theological eminence by a thorough study of philology, and was thus led to a more correct exegesis of the biblical authors, and to more liberal views of theology in general. In fact, it is mainly to him that we owe the proper method of theological exposition, in so far as it rests upon correct grammatical elucidation. He shewed his ability as an accurate critic and grammarian, in his editions of Xenophon's *Memorabilia of Socrates;* the *Clouds* of Aristophanes, *Homer*, *Callimachus*, *Polybius*, *Suetonius*, and *Tacitus;* but above all, by his admirable edition of Cicero (5 vols., Leip. 1737—1739), to which he added a *Clavis Ciceronia*, by way of supplement. He was also the first reviver of true and manly eloquence in Germany. His theological writings are numerous. The most remarkable are the *Initia Doctrinæ Solidioris*, the *Institutio Interpretis Novi Testamenti* (which has been translated into English), the *Anti-Muratorius* (1755), and the *Opuscula Theologica* (1792). Compare Bauer *Formulæ ac disciplinæ Ernestianæ indoles* (Leip. 1782). Stallbaum *Die Thomas-schule zu Leipsic* (Leip. 1839).

ERNST, Elector of Saxony, the founder of the Ernestinian line, or the elder branch of the princely House of Saxony, was the elder son of the Elector Friedrich the Mild, and of Margaret, Archduchess of Austria. When only 14 years of age, he was seized and carried off from the castle of Altenburg, along with his brother Albrecht, but was speedily recaptured. This incident, known in German history as the Stealing of the Princes (*Prinzenraub*), has been described with extraordinary vividness by Carlyle in the *Westminster Review*, January 1855. He succeeded to the electoral dignity on the death of his father in 1464, but governed in common with his brother for 21 years. In 1485, however, E. and Albrecht divided the paternal possessions, when the former obtained as his share Thuringia, the half of the district then called Osterland, with Voigtland, the Franconian estates of the House, the electoral dignity, and the dukedom of Saxony. E. was a man who took a great interest in the welfare of his people. Against injustice, tyranny, and lawlessness, he was implacable. He died at Kolditz in 1486. It is next to impossible to trace the course of the Ernestinian line through the labyrinthine mazes of the endless German genealogies; it is sufficient to say that after 1638 the Ernestinian line was represented by the Dukes of Weimar, who gradually obtained the whole possessions of the House. Johann, Duke of Weimar, who died in 1605, left several sons, the eldest of whom, Wilhelm, became the founder of four different branches, all of which, however, were reunited under Ernst August, Duke of Weimar, who died in 1748. After 1815, the duchy of Weimar became the grand-duchy of Saxe-Weimar-Eisenach, and its present ruler is of course the direct representative of the Ernestinian line. The other three families by which it is now also represented are those of Meiningen, Saxe-Coburg-Gotha, and Altenburg.

ERNST I., surnamed the Pious, Duke of Saxe-Gotha and Altenburg, founder of the House of Gotha, was born at the castle of Altenburg, 24th December 1601. He was the son of that Johann, Duke of Weimar, mentioned in the previous article, who died in 1605, and was thus connected with the main Ernestinian line. E. was the ninth of ten brothers, the youngest of whom was the famous Bernhard (q. v.) von Weimar. He received an excellent education from his mother, Dorothea Maria von Anhalt. After the arrival of Gustavus Adolphus in Germany, E. entered the Swedish service, and in various engagements exhibited great courage and skill, completing the victory of the Protestants at Lützen, after the fall of Gustavus. After the battle of Nördlingen, 26th August 1634, E. withdrew from the theatre of strife, and for the rest of his life devoted himself to restoring the prosperity of his territories, which had been frightfully devastated during the Thirty Years' War. He died in 1675. Of his seven sons, the eldest, Friedrich, continued the line of Gotha, while the third became the founder of the House of Meiningen, and the seventh, the founder of the House of Saalfeld. E. is a fine type of the old German Protestant prince. Zealously attached to the doctrines and government of the Lutheran Church, he exercised a constant watch over its religious and educational interests. With the formalism, however, that often characterises 'strictly religious' people, he compelled his children to learn the whole Bible by heart. He was much interested in the cause of Christianity abroad, and invited to his court the Abbot Gregorius from Abyssinia, besides sending thither on a religious embassy Joh. Mich. Wansleb of Erfurt. He also carried on a correspondence with the king of Ethiopia and the Patriarch of Alexandria. His line became extinct by the death of Friedrich IV. in 1825.

ERNST IV. (August Karl Johannes Leopold Alexander Eduard), Duke of Saxe-Coburg-Gotha, and elder brother of Prince Albert (q. v.), was born at Coburg 21st June 1818. Both brothers received an admirable literary and scientific education. The family to which he belongs is a branch of the Ernestinian line, having been founded in 1680 by Albrecht, second son of Ernst the Pious (q. v.). When E. had completed a university curriculum at Bonn, he entered the military service of the king of Saxony, but left it on the occasion of his marriage with the daughter of the Grand-duke of Baden. In 1844, E. succeeded his father as Duke of Saxe-Coburg-Gotha. In his opinions and aspirations, imbued with the spirit of his age, he has introduced into his little dominions many beneficial reforms, and allayed not a few long-standing jealousies. Yet one regrets to say, that his enlightened views of his duty as a ruler have not been generally appreciated by his subjects. During the stormy period of 1848—1849, by spontaneous concessions on the one hand, and on the other by an energetic repression of the political anarchists, he contrived to save his territories from the perils of revolution. In the Slesvig-Holstein war, E. took a prominent part, and on the 5th April 1849 won the battle of Eckenförde. E. is a great advocate for the unity of the German nation, and has taken a prominent part in most of the efforts made in that direction. His leisure hours are devoted to music and the fine arts. His operas, *Zayre* and *Casilda*, are well known in Germany, and recently (1861) he has published a pamphlet (which is virtually an autobiography) vindicating the principles on which he governs his duchy.

ERŌS. See Cupid.

ERO'SION, the influence of a stream or river in hollowing out its channel. Even the smallest streams, when running over soft strata, as clay or sand, cut out channels, and remove the eroded materials. Hollows thus produced have been observed among the stratified rocks. One that occurs in the coalfield of the forest of Dean has been carefully described. The trough was found to branch, when traced in the progress of mining, over a considerable area, and to assume all the appearances of a little stream, with small tributaries falling into it. When the hollows thus abraded are of considerable extent, '*valleys of erosion*' are produced. Many of the earlier geologists held that rivers had hollowed out their own valleys. The immense amount of materials brought down by rivers, and deposited at their mouths as deltas, shews without doubt that they have contributed materially to produce inequalities on the earth's surface; but the examination of the geological structure of valleys, plainly testifies that almost every great hydrographical basin has derived its form originally from some other agency, although its outline may have been subsequently altered by the continued action of currents within it.

ERO'TIC (from the Greek *eros*, love), signifying in general whatever is marked by love or passion; but the term is chiefly applied to poetical pieces of which love is the predominating subject.

EROTOMA'NIA, a species of mental alienation caused by love. See Mania.

ERPE'NIUS (Latinised from Thomas van Erpen), one of the earliest and most eminent of European Orientalists, was born at Gorkum, in Holland, 7th September 1584. At an early age, he was sent to Leyden, where he directed his attention first to theology, but afterwards more particularly to the study of Oriental languages. Having completed his educational course, he travelled through England, France, Italy, and Germany; and in 1613, became professor of Oriental languages at Leyden. Here he erected an Arabic press in his own house, caused new types to be cut, and not only wrote but printed a great number of important works bearing on his favourite studies. The professorship of Hebrew not being vacant at the time of E.'s translation to the university of Leyden, a second Hebrew chair was founded expressly for him in 1619. Soon after this he was appointed Oriental interpreter to the government, in which capacity he read and wrote replies to all official documents coming from the East. Such was the elegance and purity of his Arabic, as written at this time, that it is said to have excited the admiration of the Emperor of Morocco. Towards the close of his life, tempting offers of honours and distinction came pouring in upon him from all parts of Europe; but he was never prevailed upon to leave his native country, where, in the midst of an eminent career, he died 13th November 1624. Although the present standard of Oriental knowledge in Europe is much in advance of that of E.'s day, there is no doubt that it was through him principally that Eastern, especially Arabic studies have become what they are. With hardly any better material than a few awkwardly printed Arabic alphabets, he contrived to write his famous grammar (*Grammatica Arabica, quinque libris methodice explicata*, Leyden, 1613; recent edition by Michaelis, Gött. 1771), which for 200 years, till the time of Silvestre de Sacy, enjoyed an undisputed supremacy; and there are many who think his *Rudimenta* unsurpassed, even at the present day, as a work for beginners. Among his other important works the best known is his *Proverbiorum Arabicorum Centuriæ Duæ* (Leyden, 1614).

ERRA'TA, the list of errors with their corrections placed at the end of a book. From greater carefulness in correcting the sheets of a work in passing through the press, errors in sense or typography are now much more rare than formerly; in many instances, indeed, books are now produced without a single error which needs to be pointed out and corrected. On the subject of errata, some interesting particulars will be found in Disraeli's *Curiosities of Literature*, of which the following may be taken as a specimen: 'Besides the ordinary *errata* which happen in printing a work, others have been purposely committed, that the *errata* may contain what is not permitted to appear in the body of the work. Wherever the Inquisition had any power, particularly at Rome, it was not allowed to employ the word *fatum*, or *fata*, in any book. An author, desirous of using the latter word, adroitly invented this scheme: he had printed in his book *facta*, and in the *errata* he put, "For *facta*, read fata."'

ERRA'TICS, the name given to the water-worn blocks of stone that have been washed out of the boulder clay, or are still enclosed in it, because they have generally been derived from rocks at a distance. See BOULDERS and BOULDER-CLAY.

E'RRHINES (Gr. *en*, in, and *rhin*, the nose), medicines administered locally to produce sneezing and discharge from the nostrils, in catarrh, and in various disorders of the head and eyes. Common snuff, and various other vegetable irritants in powder, have been used for this purpose.

E'RROR, PROCEEDINGS IN, the form by which in England the unsuccessful party in an action at law brings his case for consideration before a court of review. The successful party is entitled to issue execution immediately on the (signing of) final Judgment (q. v.), unless execution be stayed by due notice of the intention of the opposite party to bring the judgment under review. Error may be in fact or in law. If the error is in fact, the case is heard before the court before which the action was originally tried; if the error is in law, proceedings must be taken before the Court of Exchequer Chamber (q. v.). Where a party objects to the ruling of the judge, the form is by Bill of Exceptions (q. v.) under statute of Westminster the second (13 Ed. I. c. 31). According to the former practice, it was necessary, in order to obtain a review on the ground of error, that an original writ, called a Writ of Error, should be issued. The writ, if the error was in fact, was styled *coram nobis*, where the case was in the Queen's Bench, the sovereign being presumed to preside in that court; if in the other courts, the writ was *coram vobis*. Writ of error is abolished by the Common Law Procedure Act; and proceedings in error now consist of a simple memorandum of error, lodged with the officer of the court, accompanied, if the error be in fact, with an affidavit of the matter constituting the error. The effect of proceedings in error is to stay immediate execution; but the plaintiff in error must proceed within a certain number of days. From judgment in error in the Exchequer Chamber, an appeal lies to the House of Lords. Proceedings in error from the Court of Common Pleas of Lancaster, and from the Court of Pleas of Durham, and generally from all inferior courts of record, are brought before the Court of Queen's Bench, from which appeal lies to the Exchequer Chamber, and thence to the House of Lords. The courts of the city of London, of the Cinque Ports, and of the Stannaries of Cornwall, are exceptions to this rule. In criminal cases, proceedings are still by Writ of Error (q. v.).

ERROR, WRIT OF, in civil causes. See ERROR, PROCEEDINGS IN. *In criminal causes*, is an original writ from the common law side of the Court of Chancery, addressed to the judges of a superior court, by which they are authorised to examine the record on which judgment was given in the inferior court, and to confirm or reverse the judgment. Writ of error formerly lay for every substantial defect appearing on the face of the record, for which the indictment might have been quashed; but by 7 Geo. IV. c. 64, it was provided that several technical defects should be cured by verdict. By 14 and 15 Vict. c. 100, every formal defect apparent on the face of the indictment must be objected to before the jury is sworn, and not after, and may then be amended. Writ of error now, therefore, lies only for defect in substance appearing on the record, as where a man having been indicted for perjury, it appears that the false statements were not made upon oath. Writ of error cannot be obtained without the *fiat* of the attorney-general, which is not allowed as of course, but is usually granted on due cause shewn.

ERRORS. In all observations, errors must be made. The best instruments have imperfections; and no man, however equable his temperament, can always rely on his making a proper use of his senses. As in astronomy numerical correctness in the results of instrumental measurements is of the first consequence, it is the constant care of the observer to detect and make allowance for errors. The three principal sources from which they may arise are—1st, External or incidental causes, such as fluctuations of weather, which disturb the amount of refraction; changes of temperature, affecting the form and position of instruments, &c.; 2d, *Errors of observation*, being such as arise from inexpertness, defective vision, slowness in seizing the exact instant of an occurrence, atmospheric indistinctness, &c.; and such errors as arise from slips in clamping and momentary derangements of the instrument; 3d, Instrumental defects, owing to errors in workmanship, and such as arise from the instrument not being properly placed—called errors of adjustment. The first two classes of errors, so far as they cannot be reduced to known laws, vitiate the results of observations to their full extent; but being accidental, they necessarily sometimes diminish and sometimes increase them. Hence, by taking numerous observations under varied circumstances, and by taking the *mean* or *average* of the results obtained, these errors may be made to destroy one another to a great extent, and so far may be subdued. With regard to the third class, it is the peculiarity of astronomical observations to be the ultimate means of detection of all defects of workmanship and adjustment in instruments, which by their minuteness elude every other mode of detection. See Sir John Herschel's *Outlines of Astronomy*, § 138 *et seq.* It may be mentioned, however, that the method of subduing errors of the first two classes by the law of average is not applicable in all cases. In certain cases, recourse must be had to what is known as the method of least squares. See SQUARES, THE LEAST; see also PROBABILITIES.

ERSCH, JOHANN SAMUEL, the founder of German bibliography, was born at Grossglogau, in Lower Silesia, 23d June 1766; and exhibited from an early period a decided bias towards that branch of literature in which he afterwards obtained so high a reputation. At Halle, where he was sent to study theology in 1785, he devoted himself to historical investigations. After several vicissitudes, he obtained, in 1800, the office of librarian to the university of Jena. Three years later, he was called to Halle as professor of geography and statistics; and in 1808, was appointed, in addition, principal librarian. He died at Halle, 16th January 1828. E. was long engaged in miscellaneous bibliographical work for other scholars; but in 1818, along with Gruber, commenced the publication at Leipsic of the *Allgemeine Encyclopädie der Wissenschaften und Künste* (Universal Encyclopædia of the Sciences and Arts), a work of immense value. By his *Handbuch der Deutschen Literatur seit der Mitte des* 18 *Jahrh. bis auf die Neueste Zeit* (Handbook of German Literature from the Middle of the 18th Century to the most recent Time, 4 vols., 1812—1814), he first established modern German bibliography in the technical sense of the word; and by its completeness, accuracy, and mode of arrangement, it is undoubtedly fitted to serve as a model for the imitation of other nations.

ERSE (a corruption of *Irish*), the name given by the Lowland people of Scotland to the language spoken by the inhabitants of the Western Highlands, as being of Irish origin. See Bretts and Scots. The proper name is Gaelic (q. v.).

ERSE′K-UJVA′R. See Neuhausel.

E′RSKINE, Rev. Ebenezer, the founder of the Secession Church in Scotland, was the son of the Rev. Henry Erskine, minister of Chirnside, in Berwickshire, a descendant of the noble family of Mar, and was born June 22, 1680. He studied at Edinburgh, and after acting for some time as tutor and chaplain in the family of the Earl of Rothes, he was licensed to preach the gospel by the presbytery of Kirkcaldy in 1702. His abilities and excellent character soon brought him into notice, and in the following year he was appointed minister of Portmoak, in the shire of Kinross. Here he applied himself indefatigably to the study of the Scriptures, and became so deeply convinced that to preach 'Christ crucified' was his grand and constant duty as a minister, that after some time the earnestness, unction, and piety which now marked his discourses, became exceedingly attractive to the people accustomed to the chilling 'legalism' which then predominated in the Scottish pulpit. E.'s popularity was not confined to the parish of Portmoak; serious Christians from all parts of the country were eager to enjoy occasionally the benefits of his ministry, and on sacramental occasions, he had frequently attendants from the distance of 60 or 70 miles. In 1731, he was translated to Stirling, after having discharged the pastoral office in Portmoak for 28 years. Previous to this event, however, the religious peculiarities of E. had brought him into unpleasant relations with some of his brethren, by the interest which he exhibited in a book called the *Marrow of Modern Divinity*, marked by its strong evangelicalism of doctrine and sentiment. After his transference to Stirling, E. distinguished himself by his advocacy of popular rights in the settlement of ministers; and ultimately involved himself in such antagonism to the Church of Scotland, or at least to the ruling party in it of the time, that, along with other three clergymen, he was deposed in 1733. (For an account of the circumstances which led to these depositions, see United Presbyterians.) He was shortly after joined by his brother Ralph and several other ministers. They now virtually formed a distinct sect, but they still continued to occupy their parish churches. An effort was made in 1734 to restore them to their legal connection with the church; it was unsuccessful. In 1736, E. and his friends formally seceded, but still it was not till 1740 that they were ejected from their churches. Shortly after this, a furious, and, as it seems to people now-a-days, a contemptible squabble broke out among the seceders in regard to the propriety of taking the burgess-oath. The result was a division of the sect into two bodies, the Burghers and Antiburghers. See United Presbyterians. E. was the leader of the Burghers. He died June 22, 1756.

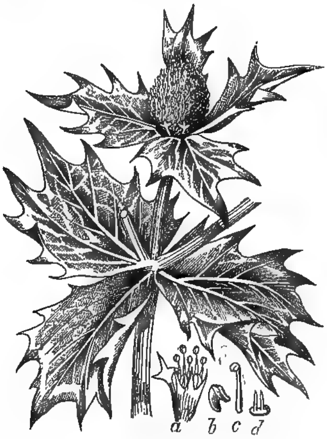
ERSKINE, Rev. Ralph, brother of the preceding, was born at Monilaws, in Northumberland, March 18, 1685, and after completing the usual course of study incumbent on a minister, was ordained to the parish church of Dunfermline in 1711. Sympathising with the sentiments of his brother Ebenezer, he withdrew from the judicatures of the Established Church in 1737. In the controversy concerning the burgess-oath he also took part with his brother. E. died November 6, 1752. His fame rests chiefly on his *Gospel Sonnets* and other religious works, which were once highly popular.

ERSKINE, John, of Carnock, and afterwards of Cardross, an eminent Scottish jurist, and Professor of Scots Law in the university of Edinburgh, was the son of the Honourable John Erskine of Carnock, third son of Lord Cardross, whose descendants have now succeeded to the earldom of Buchan. John Erskine, the father, was a man of importance in his day, not only on account of the family to which he belonged, which even then had been prolific in historical characters, but in consequence of his personal qualities and the positions which he held. Having been forced to quit Scotland, from his attachment to the Presbyterian religion, he retired to Holland, and became an officer in the service of the Prince of Orange. At the Revolution, he accompanied William to England, and, as a reward for his services, was appointed lieutenant-governor of Stirling Castle, and lieutenant-colonel of a regiment of foot. John E., the younger, born 1695, became a member of the Faculty of Advocates in 1719, but did not succeed as a practitioner of the law. On the death of Alexander Bain in 1737, Mr E. was nominated to succeed him in the chair of Scots Law, an office the duties of which he performed with great reputation for 28 years. For many years Mr E. made use of Sir George Mackenzie's (q. v.) *Institutions of the Law of Scotland* as his text-book; but in 1754 he published his well-known *Principles of the Law of Scotland*, which were thenceforth used for that purpose by himself and by his various successors down to the present time. On his retirement from the professorship in 1765, Mr E. occupied himself in preparing his more important work, *The Institutes of the Law of Scotland*, but it was not published till 1773, five years after his death. Mr E. was twice married—first to Miss Melville, of the noble family of Leven and Melville, by whom he left the afterwards celebrated clergyman, John Erskine; and, second, Ann, second daughter of Stirling of Keir, by whom he had four sons and two daughters. As a legal writer, Mr E. is inferior to none of our Scottish jurists, with the single exception of Lord Stair, who had the benefit of the more learned and wider judicial training of our earlier lawyers, who were educated in a continental school. In consequence of the extent to which lands changed hands in Scotland subsequent to the rebellions, feudal conveyancing became the most prominent subject of study amongst the lawyers of Mr E.'s day, and the principles of commercial law, of which Stair laid the foundation, and which have become so important in our own time, were somewhat thrown into the shade. The labours of Mr Bell in these departments have again brought the law of Scotland into connection with the general current of European law and mercantile practice throughout the world. But of all those departments which constitute the law of Scotland, as developed by the usages and forms of society in the country itself, there is at the present day no clearer, sounder, or more trustworthy expositor than Mr Erskine.

ERSKINE, Rev. Dr John, son of John Erskine of Carnock, the author of the *Institutes* *of the Law of Scotland*, was born June 2, 1721, studied at the university of Edinburgh, and in 1743 was licensed to preach by the presbytery of Dunblane. In the following year, he was ordained minister of Kirkintilloch, where he remained until 1753, when he was presented to the parish of Culross, in the presbytery of Dunfermline. In 1758, he was translated to New Greyfriars Church, Edinburgh; in 1766, the university of Edinburgh conferred on him the honorary degree of Doctor of Divinity; and in 1767, he was promoted to the collegiate charge of Old Greyfriars, where he had for his colleague Dr Robertson. In the General Assembly of the Church of Scotland, he was for many years the leader of the popular or evangelical party; and there the openness and integrity of his character secured him the confidence and affection of his friends, and the esteem and respect of his opponents. Between him and Principal Robertson, the leader of the moderate party, there was a courteous and honourable friendship; and the funeral sermon which he preached on the death of his colleague, did equal honour to E.'s head and heart. He died January 19, 1803. E.'s writings are exceedingly numerous. They consist of essays, letters, sermons, dissertations, and pamphlets, &c., mainly of a religious character, and exhibit a superior degree of ability. Sir Walter Scott, in his *Guy Mannering*, gives a graphic and accurate description of his powers as a preacher.

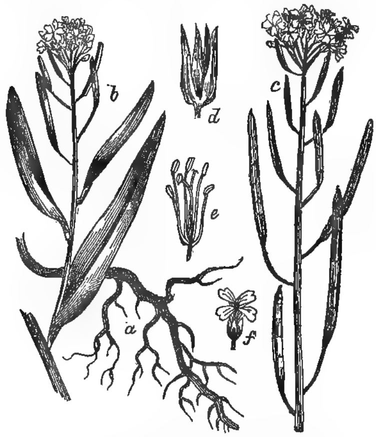
ERSKINE, THOMAS, LORD ERSKINE, was the youngest son of Henry David, tenth Earl of Buchan; and was born in Edinburgh, 10th January 1750. Although his father, at the period of his birth, was reduced to an income of £200 a year, he transmitted to him the blood of a race which had been prolific in men of great ability, and had been ennobled before the era of genuine history. The countess, who was the daughter of Sir James Stewart of Goodtrees, in the county of Midlothian, was not only a godly Presbyterian and a skilful housewife, but a gifted and accomplished woman. After E. had attended for some time the High School of Edinburgh, the family removed to St Andrews, at the grammar school of which place, and subsequently at the university, though never it would seem as a matriculated student, Thomas E. received the rest of such education as fell to his share. His desire was to study for a profession; but his parents, who had sent his elder brother, Lord Cardross, to Leyden, and were educating his second brother, Henry, afterwards the well-known Harry Erskine, for the Scottish bar, could not afford the expense of a third learned education, and sent him to sea as a midshipman. In this capacity he served for four years, until the death of his father, when he purchased a commission in the First Royals, and was for some time stationed at Minorca, where he employed his leisure time in the study of English literature. On his return to London, his birth, his acquirements, the elegance of his manners, and volubility of his conversation, led to his being warmly received in the best circles. It was then that he had the controversy with Dr Johnson on the respective merits of Fielding and Richardson which Boswell has recorded; and that he published a pamphlet on the prevailing abuses in the army, which, though anonymous, was well known to be his, and obtained a great circulation. E. now grew tired of the army as a profession, in which he saw little chance of promotion; and while in this humour, an accidental interview which he had with Lord Mansfield at an assize court, determined him to prosecute the study of law. E. was admitted a student of Lincoln's Inn, 26th April 1775, and on the 13th January 1776, he entered his name on the books of Trinity College, Cambridge, as a gentleman commoner. Many anecdotes are told of the privations which E. underwent when studying for the bar—how he lived on 'cow-heel and tripe,' dressed so shabbily as to be quite remarkable, and boasted that *out of his own family* he did not know a lord. Such stories, though probably exaggerated, prove that he endured considerable privations—considering his rank—in fitting himself for the legal profession. Lord Campbell says, that 'during Easter and Trinity terms he excited a great sensation in the dining-hall by appearing with a student's black gown over the scarlet regimentals of the Royals; *probably not having a decent suit of plain clothes to put on*.' Though E. was aided by his aristocratic connection, his rise was still very wonderful. Without the advantage of a business training, or what, probably even in those days, was far more important, a business connection, he rose into practice with almost unprecedented rapidity. After his first speech, the attorneys actually flocked round him with their retainers, and in telling the story, he used sometimes to bring the number which he received before quitting Westminster Hall up to sixty-five! His two first clients were officers in the navy—Captain Baillie, who held an office in Greenwich Hospital, against whom a rule had been obtained calling upon him to shew cause why a criminal information for a libel reflecting on Lord Sandwich's conduct as governor of the charity, should not be filed upon him; and Admiral Keppel, who was tried by a court-martial at Portsmouth for incapacity and misconduct in an encounter with the French fleet off Ushant; and in both cases E. derived benefit from his own early connection with the service and the special information which he thus possessed. Admiral Keppel sent him two five-hundred-pound notes as a fee. From this time forth, E.'s good-fortune as an advocate was uninterrupted. In 1783, he was returned to parliament for Portsmouth. Four years and a half after he was called to the bar, he had cleared £8000 to £9000, besides paying his debts, he had got a silk gown, business of at least £3000 a year, and a seat in parliament, and had made his brother Lord Advocate. In parliament, on the other hand, he failed so egregiously in his first speech as to leave scarcely any hope in the bosoms of his admirers, and what is very singular, his failure and Lord Eldon's took place the same night. To some extent the phenomenon was accounted for by Sheridan's remark when he said to him: 'Erskine, you are afraid of Pitt, and that is the flabby part of your character.' But notwithstanding his political mortifications, his professional career went on with increasing brilliancy. In 1786, he was made Attorney-general to the Prince of Wales, by whom he was warmly patronised, but towards him and every one else he exhibited that manly independence which was the best part of his character. The fact of his appearing as counsel for Thomas Paine is more to his credit, than even the brave and honest speech which he made in his defence; whilst his removal in consequence from his office is, as Lord Campbell has said, a lasting disgrace to those from whom the measure proceeded. Throughout the political trials which occurred in this country at that troubled period, he enacted the same manly part. When E. was proposed for the woolsack, an office far beyond his legal attainments, the king, George III., in consenting exclaimed: 'What! what! well! well!—but remember he is your chancellor, not mine.' Yet his decisions as lord-chancellor, according to Lord Campbell, are not so much *bad* as *superficial*, though by some equity practitioners they are spoken of as the *Apocrypha*. E. was engaged in the defence of Queen Caroline. He died 17th November 1823.

ERY'NGO (*Eryngium*), a genus of plants of the natural order *Umbelliferæ*, having simple umbels, which resemble the heads of composite flowers, a leafy involucre and leafy calyx, and obovate, scaly fruit destitute both of ridges and vittæ. The species are numerous, mostly natives of the warmer temperate parts of the world, with alternate, simple, or divided leaves, which have marginal spines. One species only is common in Britain, the SEA ERYNGO, or SEA HOLLY (*E. maritimum*), which is frequent on sandy sea-shores; a very stiff, rigid, and glaucous plant. *E. campestre* has also been found in England and Ireland, but is very rare. Its root was formerly much employed in some parts of Europe as a tonic. That of *E. maritimum* is used in the same way, and possesses the same properties, being sweet and aromatic. It is sold in a candied state, and was formerly reputed stimulant, restorative, and aphrodisiac. Shakspeare makes Falstaff allude to the snowy colour and supposed properties of this now almost disused sweetmeat, for the preparation of which Colchester has long been famous above all other places. E. root has also been used as an aperient and diuretic. Linnæus recommends the blanched shoots of *E. maritimum* as a substitute for asparagus. *E. fœtidum*, a native of the warm parts of America, is called Fit-weed in the West Indies, a decoction of it being much used as a remedy in hysterical cases. *E. aquaticum*, a native of low wet places in North and South America, is called Rattlesnake Weed and Button Snakeroot. The root is diaphoretic and expectorant, and has a spurious reputation as a cure for the bite of the rattlesnake.



Sea Holly (*Eryngium maritimum*):
a, a floret; *b*, a petal; *c*, a stamen; *d*, the pistil.

ERY'SIMUM, a genus of plants of the natural order *Cruciferæ*, tribe *Sisymbrieæ*. The pod is four-sided. *E. cheiranthoides*, a branching annual, about 18 inches high, with lanceolate scarcely toothed leaves and small yellow flowers, is found in many parts of Europe, and also in North America. It is not uncommon in waste places and cultivated grounds in Britain, but may perhaps have been originally introduced for its medicinal use. Its seeds were formerly much employed as an anthelmintic, from which it has the name of WORM-SEED. It is also called TREACLE MUSTARD, because it was employed as an ingredient in the famous *Venice Treacle*. *E. perfoliatum* is cultivated in Japan for the fixed oil of its seeds. Some of the plants formerly referred to E. are now included in other genera, as *Sisymbrium* (q. v.) and *Alliaria* (q. v.).



Erysimum Cheiranthoides:
a, root; *b*, a branch, in which flowering has recently begun; *c*, the summit of a branch in a more advanced state, shewing the fruit; *d*, the calyx; *e*, the parts of fructification, divested of floral envelopes; *f*, a flower.

ERYSI'PELAS (Gr. derivation uncertain), an inflammatory and febrile disease of the skin, attended by diffused redness and swelling of the part affected, and in the end either by desquamation or by vesication of the cuticle, or scarf-skin, in the milder forms, and by suppuration of the deeper parts in the severer varieties of the disease (phlegmonous erysipelas). Erysipelas affects, in a large proportion of instances, the face and head; it is apt to be attended with severe and typhoid fever (see FEVER), and often with great disorder of the nervous system, arising in some instances from inflammation of the membranes of the brain. In other parts of the body, severe or phlegmonous erysipelas is apt to be succeeded by protracted and exhausting suppurations, and sometimes by diseases of the bones, or inflammations of the internal organs. Erysipelas is frequently an Epidemic (q. v.) disease; it is also very apt to recur in a person who has been attacked once or oftener; and this is especially true of the form which affects the face. It is seldom that depletion is allowable in erysipelas, but the bowels should be well cleared out in most cases, and a Diuretic (q. v.) given, after which the treatment consists for the most part in watching narrowly the progress of the case, keeping up the strength as well as possible, and obviating special dangers as they occur. In some cases, iron is used as a specific remedy.

ERYTHE'MA (Gr. *eruthainō*, I redden), a minor form of Erysipelas (q. v.), presenting the same tendency to diffusion and redness, but not so much swelling, and little disposition towards suppuration, or even vesication. Erythema is chiefly dangerous when it presents itself in a wandering shape, attended with slow consuming fever. The muriated tincture of iron, in doses of twenty drops in water every hour or two, has been regarded as a specific in this disease, as well as in erysipelas. Some forms of erythema are distinctly connected with constitutional diseases, as gout, rheumatism, syphilis, &c., and depend for their cure on the removal of the cause.

ERYTHRÆ'A. See CENTAURY.

ERYTHRI'NA. See Coral Flower.

ERYTHRO'NIUM, a genus of bulbous-rooted plants of the natural order *Liliaceæ*, with drooping flowers and the segments of the perianth reflexed. *E. dens canis*, the Dog-tooth Violet, so called because of the resemblance of its little white bulbs to dogs' teeth, is a well-known ornament of our flower-borders in spring. It is a native of the central parts of Europe and south of Siberia. Anthelmintic properties are ascribed to the bulbs. Those of *E. Americanum* are emetic.

ERYTHROPHLÆ'UM, a genus of trees of the natural order *Leguminosæ*, sub-order *Mimoseæ*. *E. Guineense*, a native of Guinea, is a very large tree, 100 feet high, remarkable for the great quantity of red juice which every part of it contains, and interesting on account of the employment of this juice by the natives for an ordeal to test the innocence or guilt of a person accused of crime. The juice is swallowed in large draughts, and those who remain uninjured by it are supposed to be innocent.

ERYTHROXYLA'CEÆ, a natural order of exogenous plants, allied to *Malpighiaceæ*. They are trees or shrubs, with alternate simple leaves, stipules, flowers growing from amidst scale-like bracts, calyx of five sepals, corolla of five petals, each petal having a curious appendage—a plaited scale—at the base, ten stamens united at the base, a 3-celled ovary with two cells empty, and the third containing a single ovule, three styles, and the fruit a drupe. Nearly 100 species are known, natives of warm countries, and chiefly of tropical America. To this order belongs the Coca (q. v.). The wood of some of the species is bright red; that of *Erythroxylon* (Gr. red wood) *suberosum* is used in Brazil for dyeing, and a permanent red is obtained from it. That of *E. hypericifolium* is the *Bois d'huile* (Oil-wood) of Mauritius.

E'RZBERG. See Eisenerz.

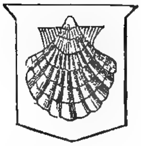
ERZERU'M, or **ERZROU'M,** properly *Erserum*, a strongly fortified town in Turkish Armenia, in lat. 39° 55′ N., long. 41° 20′ E., not far from the northern source of the Euphrates. It is situated in a high, but tolerably well cultivated plain; its site being 5800 feet above the level of the sea. The climate is cold in winter, but dry in summer. E. is the residence of an English, a Russian, and a French consul; and in 1854, was believed to contain upwards of 40,000 inhabitants, consisting of Turks, Armenians, and Persians, who carry on a brisk trade, and have thus attained to a degree of prosperity unusual in the East. The copper and iron wares of E. have acquired a wide celebrity. Situated at the junction of the important highways leading from Trebizond, Transcaucasia, Persia, Kurdistan, Mesopotamia, and Anatolia, E. forms an entrepôt of commerce between Europe on the one hand, and the interior of Asia, and particularly Persia, on the other. The streets, the houses of which are built of mud, wood, or sun-dried bricks, are narrow, crooked, and filthy; and ruins of fortifications and of buildings formerly magnificent, everywhere meet the eye. The town consists of the fortress, strictly so-called, and four suburbs. The fortress, which is enclosed by a high wall, has, on the west, a citadel called Ijkaleh, with many curious monuments, and a mosque of Christian origin. The fortress also contains 15 mosques, the residence of the chief magistrate, some caravanseras, and a few elegant houses belonging to the higher order of officials and Mohammedan merchants. The suburbs boast 24 mosques, several Armenian churches, and a number of large bazaars and caravanseras. E. imports shawls, silk goods, cotton, tobacco, rice, indigo, &c.; and exports corn, sheep, and cattle, horses, mules, and gall-nuts. The native manufactures here have been in part superseded by British manufactures, of which it is estimated 6000 bales, valued at £300,000, are annually retailed in the bazaars. E. is a very ancient town. Its Armenian name was *Karin* or *Garin Khalakh* (the city of the district of Garin), whence the Arabian califs called it *Kali-Kalah*. Anatolius, the general of the Emperor Theodosius II., erected here the fortress of Theodosiopolis, in the 5th c., to the north-west of the Syro-Armenian trading town of Arsen. When this place was destroyed by the Seljuks, the inhabitants retreated to the fortress of Theodosiopolis, to which they gave the name *Arsen-er-Rum*, i. e., Arsen of the Romans (or Byzantines), whence the modern Erzerum. After 1049 it was a thriving emporium; but in 1201 it fell into the hands of the Seljuks, when 100 churches were destroyed, and 140,000 inhabitants lost their lives. In 1242, it came into the possession of the Mongols; and, finally, in 1517, into that of the Turks. It still, however, continued to be the most important city in the country, and at the commencement of the 19th c. had a population of 100,000 inhabitants. In the war of 1829, between the Turks and Russians, the taking of E. by the latter decided the campaign in Asia. It was restored to the Turks at the peace of Adrianople.

E'RZGEBIRGÉ ('Ore Mountains'), the name given to the chain of mountains, rich in metals, stretching in a south-westerly direction, on the confines of Saxony and Bohemia, from the valley of the Elbe to the Fichtelgebirge, in long. 12° 20′ E. In the south, it rises to a height of from 2000 to 2500 feet, forming a steep wall of rock; in the west, it forms broad, slaty plateaux, and gradually slopes down towards the Saxon side to the level districts of Altenburg and Leipsic. In consequence of this formation, the streams flowing southward are small, while the north side of the chain, which is well wooded, presents a series of romantic, and occasionally fertile and thickly peopled valleys, watered by the Mulde, the Pleisse, and their numerous tributaries. The town of Gottesgabe, the site of which is the highest in Germany, is situated towards the south of the E. range, in long. 12° 54′ E., at an elevation of 3162 feet. The Keilberg, the highest point of the range, is 3802 feet above the level of the sea. The E. is chiefly of the gneiss-granite formation, in which most of the metal strata are to be found. Porphyry and basalt likewise appear.

E'SAU ('hairy' or 'rough'), the eldest son of Isaac, and twin-brother of Jacob. As E. grew up, he became 'a man of the field,' a cunning hunter, and his father's favourite. He seems to have been a wild, rough, hearty Bedouin, or son of the desert, thinking nothing of to-morrow, but living with joyous carelessness from day to day. This is apparent from the manner in which he allowed Jacob to defraud him of his birthright, although it carried with it, besides many temporal advantages, the *Covenant-blessing* itself. After this transaction, E., when 40 years of age, married two Canaanitish women, 'which were a grief of mind unto Isaac and to Rebekah' (Gen. xxvi. 35). Then follows the narrative of Jacob's personation of his brother, and his securing irrevocably the blessing to himself. E. now swore to kill his brother, whereupon Rebekah sent Jacob to his uncle Laban in Padanaram. E. next married his cousin Mahalath, the daughter of Ishmael; and appears to have established himself in his wife's country, to the south of Palestine in Mount Seir. Here he lived probably as a predatory chief. When Jacob was returning from Padanaram, E. encountered him with 400 of his Bedouins. The meeting was a touching one. The wild borderer at least was in earnest. 'Esau ran to meet him, and embraced him, and fell on his neck, and kissed him' (Gen. xxxiii. 4). His anger had long died out. E. next appears at the burial of his father Isaac, whom he seems to have loved with the warm and simple affection of a child of nature, and having obtained his share of the property, 'went into the country from the face of his brother Jacob' (Gen. xxxvi. 6). From E. the region of Mount Seir took the name of Edom (q. v.), and his posterity are generally called Edomites.

E'SCALADE (Fr. from Lat. *scala*, a ladder), in siege operations, is a mode of gaining admission within the enemy's works. It consists in advancing over the glacis and covert-way; descending, if necessary, into the ditch by means of ladders; and ascending to the parapet of the curtain and bastions by the same ladders differently placed. The ladders are either procured on the spot, or are sent out with the siege-army. A convenient form is in pieces of 12 feet length, fitting end to end by means of sockets. A firing-party is usually told off, to keep down the fire of the enemy upon the escaladers, especially a flank fire lengthwise of the ditch, which might sweep them off with terrible rapidity. The leaders of an escalade constitute a 'forlorn hope.'

ESCA'LOP-SHELLS are often used in heraldry to signify that the bearer has made many long voyages by sea. As the Pilgrim's (q. v.) emblem, they were commonly given to those who had been to the Crusades; they came to be regarded as indicating either that the bearer or his ancestor had been a Crusader. The escalop-shell was the emblem of St James the Great, and is generally met with in churches dedicated to him. The more ordinary form of the name is Scallop-shell (q. v.).



Escalop-Shell.

ESCAPE WARRANT is a warrant issued by a judge for the apprehension of persons who have escaped from the Queen's Bench or Fleet prisons. This power is conferred by 1 Anne, s. 2, c. 6, followed by 5 Anne, c. 9. The warrant may be issued by any judge of the court wherein the action was tried, or judgment and execution obtained, upon oath in writing, of the escape of the party, made before himself, or before one of the commissioners to take oaths. The apprehension may be effected on Sunday. The person apprehended is committed to the charge of the sheriff of the county, who is made responsible for his safe keeping.

ESCA'PEMENT is the term applied to that part of the machinery of a watch or clock by which the onward revolving motion produced by the moving power, whether weights or spring, is brought into contact with the regulating movement of the pendulum or balance-wheel. See Horology.

ESCARP', in Fortification, is the side or slope of the ditch next the rampart, and of the parapet itself. When the ditch of a fortress is dry, the escarp is usually faced with mason-work, to render it difficult of ascent; and behind this facing (*revêtement*) there are often passages or casemates for defence. In temporary fortifications, the *revêtement* is sometimes of wood; and in field-works, palisades at the foot, or fraises on the *berme* or edge of the ditch, are held sufficient. The escarp is always made at as large an angle as the nature of the soil will allow; the design being to offer the greatest possible obstacle to an assailant.

E'SCARS are large heaps of gravel, consisting chiefly of carboniferous limestone, that were accumulated during the Pleistocene period. . They occur in Central Ireland, but are identical with the *ösar* of Sweden; and under the name of *kames*, they are not unknown in Scotland. The gravel is often heaped into narrow ridges 40 to 80 feet high, and from 1 to 20 miles long.

ESCAUT. See Scheldt.

E'SCHAR (Gr. *eschara*), a slough or portion of dead or disorganised tissue. The name is commonly applied to artificial sloughs produced by the application of Caustics (q. v.).

ESCHARO'TIC (Gr.), causing an eschar. See Caustic.

ESCHEA'T (Fr. *echoir*, from Lat. *cadere*, to fall or happen), an incident of the feudal law whereby, when a tenant in fee-simple died, leaving no heir capable of succeeding, the land reverted to his lord. By the earlier usages, this effect took place where there was no representative of the vassal in the seventh degree, which, according to later custom, was extended to male descendants *in infinitum* (*Lib. Feud.* i. 1, s. 4). According to the law of England, escheats are of two kinds—*propter defectum sanguinis*, and *propter delictum tenentis.* The former was in accordance with the feudal usage; so that if the owner of an estate in fee-simple dies without leaving an heir, and without having disposed of his estate by deed or will, the land reverts to the overlord, who in the present day is almost invariably the sovereign, except in copyhold estates, which escheat to the lord of the manor. The most frequent instance of escheat is in the case of the death of a bastard, who, having no relations but descendants, the lands on his death intestate and without issue, must revert to the crown. Escheat *propter delictum tenentis* is peculiar to the English law. It happened where a tenant in fee-simple had been guilty of treason or felony, in which case, not only his estate in possession, but any estate which might devolve upon him by the rules of descent, escheated to his lord; so that all who might succeed through him were cut off from the inheritance. This rule applied to all felonies, and was productive of much hardship. By modern legislation, it has been provided that attainder for felony shall not operate as a bar to inheritance, except in case of treason or murder (54 Geo. III. c. 145, 3 and 4 Will. IV. c. 106, 13 and 14 Vict. c. 60). This species of escheat is to be distinguished from forfeiture of lands to the crown for treason, which prevailed in other countries besides England. See Forfeiture.

Escheat in Scotland is of two kinds—1. The total forfeiture to the crown of all property heritable and movable belonging to a person who has been convicted of treason. 2. It signifies the forfeiture of goods by a debtor who has failed to make payment of debt in obedience to legal Diligence (q. v.). This species of escheat for debt was abolished by 20 Geo. II. c. 50. It was of two kinds: single escheat, and liferent escheat. By the former, all the debtor's movables were forfeited to the crown; by the latter, the annual profits of the debtor's estate were forfeited to the superior. Single escheat still exists in Scotland as a punishment of crime. In all capital convictions, it is ordered that the prisoner's 'whole movable goods and gear be escheat and inbrought to his majesty's use.' In cases of deforcement, bigamy, perjury, and some others, single escheat is imposed by statute as a portion of the penalty on conviction. Single escheat also falls upon denunciation for outlawry; and if the rebel continues for a year under denunciation, his liferent escheat falls to his superior.

ESCHELLES, Les, a village in Savoy (recently a Sardinian, now a French state), is situated on the

Guier, 12 miles south-west of Chambéry. The valley beyond this village and on the road to Chambéry is blocked up by a huge limestone rock 800 feet high, over which travellers formerly used to climb by means of ladders, and hence the name given to this village. Through this mass of limestone the public road now passes by means of a tunnel, which is 25 feet high, of equal width, and 1000 feet long. The tunnel was projected and commenced by Napoleon I., and finished in 1817 by the king of Sardinia.

E'SCHENBACH, Wolfram von, a celebrated poet of the middle ages, was born in the second half of the 12th c., of a noble family, which derived its name from the village of Eschenbach near Ansbach. He received the honour of knighthood at Henneberg, and passed his life in knightly fashion. In 1204, he came to the court of Hermann, landgraf of Thuringia, where he shone among the poets of the time, at the so-called Wartburg-war (a rivalry of the German minstrels held at Wartburg in 1206 or 1207). Hermann's successor, Ludwig the Pious, appears to have shewn E. little favour, in consequence of which he withdrew from the Thuringian court towards the close of his life. He died some time between 1219 and 1225, and was buried in his native village. E.'s poems are partly original, and partly fashioned after French and Provençal models. His rich fancy, deep sentiment, and vivid power of representation, as well as his elegant mastery of language and versification, give something of an epic character to his works, the principal of which are *Parcival*, composed before 1212, *Wilhelm von Orange*, and *Titurel*. Besides these, we have several love-songs of his. E. exercised an important influence on his time, but subsequently was almost forgotten; and it is only recently that he has been restored to his place of honour. The first critical edition of his works was that by Lachmann (Berl. 1833); they were translated into modern German by San-Martre (2 vols., Magdeb. 1836—1841). The best translation of *Parcival* and *Titurel* was executed by Simrock (2 vols., Stuttg. 1842).

E'SCHER, Joh. Heinr. Alfred, a distinguished Swiss statesman, was born at Zurich, 20th February 1819, and studied at Bonn and Berlin. In 1842, he was created Doctor of Law at Zurich; and spent the two following years in Paris, devoting his attention chiefly to studies connected with Roman law. On his return to Zurich, E. became a lecturer in the High School, the subject of his lectures being chiefly the political law of the Swiss confederacy. In 1844, he was elected member of the great council of the canton, and was thus drawn into the arena of practical statesmanship. Even at that early period, his sentiments were decidedly liberal. In January 1845, along with six others who shared his opinions, he published the famous summons to the popular assembly in Unterstrass for the expulsion of the Jesuits. His election into the Council of the Interior in 1845, and into the Council of Education in 1846, opened a wide field for his administrative talents in his native canton. The reorganisation of the schools in the canton of Zurich, according to the demands of the time, is chiefly his work. In December 1847, he became president of the great council; and in his opening speech, recommended the complete reform of the confederacy, and the greatest possible centralisation. In 1848, he was sent as a deputy to the Federal Diet; and, along with M. Münzinger, was charged with the negotiations entered into between Switzerland and Austria, in regard to the canton of Tessin. In December of the same year, on the introduction of the directorial system, E. became president of the newly elected Council of Regency. Since that time, education, the reorganisation of church policy, the law establishing the free choice of teachers and clergy by the congregations, have been the points to which his legislative and administrative energies have been chiefly directed.

E'SCHOLTZ BAY, a portion of the Arctic Ocean in Russian America, forms the innermost part of Kotzebue Sound, the first great inlet to the north-east of Behring's Strait. It is about long. 161° W., being barely on the outside of the polar circle. It is worthy of notice chiefly on account of its fossil remains, which, though common on the northern coast of Siberia, are comparatively rare on that of the new continent.

ESCHSCHO'LTZIA, a genus of plants of the natural order *Papaveraceæ*, of which *E. Californica* and other species, natives of California, have now become very common in our flower-gardens, making a showy appearance with their large deep yellow flowers. The genus is remarkable for the calyx, which separates from the dilated apex of the flower-stalk, being thrown off by the expanding flower, and much resembling in its form the extinguisher of a candle.

E'SCHWEGÉ, a town of the electorate of Hesse-Cassel, is situated on the left bank of the Werra, 25 miles east-south-east of Cassel. It consists of an old and new town, and a suburb; is surrounded with walls pierced by six gates; and is well built. The only building of note is the castle, which was long the residence of the landgrafs of Hessen-Rotenberg. E. has manufactures of woollen and linen fabrics, numerous tanneries, and several oil and other mills, also some trade in fruit and victuals. Pop. 6000.

E'SCORT. See Convoy.

ESCU'DO DE VERA'GUA denotes at once a river and an island on the Atlantic side of Central America—the latter being at the mouth of the former. They are situated a little to the east of the boundary between New Granada and Costa Rica. The island is in lat. 9° N., and long. 81° 30′ W.; and the river, being only 15 miles long, derives its importance, if any, from the narrowness of the belt which here separates the two oceans.

ESCURIAL (the correct title is El Real sitio de San Lorenzo el real de Escorial), a famous monastery of New Castile, in the province of Madrid, and situated 30 miles north-west of the town of that name. This solitary pile of granite has been called the eighth wonder of the world, and at the time of its erection surpassed every building of the kind in size and magnificence. It owes its origin (at least, so it is said) to an inspired vow made by Philip II. during the battle of St Quentin. On that occasion, he implored the aid of St Lorenzo, on whose day, 10th August 1557, the battle was fought; and vowed that, should victory be granted to him, he would dedicate a monastery to the saint. The E. is built in the form of a gridiron, in allusion to the instrument of St Lorenzo's martyrdom, and forms a huge rectangular parallelogram 744 feet from north to south, and 580 feet from east to west, and divided into long courts, which indicate the interstices of the bars. Towers at each angle of this parallelogram represent the feet of the gridiron, which is supposed to be lying upside down; and from the centre of one of the sides, a range of building abuts, forming the royal residence, and representing the handle. The E. was begun in 1563, and finished in 1584, and was intended to serve as a palace, mausoleum, and monastery. It has a splendid chapel with three naves, 320 feet long, and 320 in height to the top of the cupola. The *Pantheon*, or royal tomb, is a magnificently decorated octagon chamber, 36 feet in diameter by 38 feet high, in the eight sides of which there are numerous black marble sarcophagi. Kings only and the mothers of kings are buried here. The E. is an immense building; it is stated that it has 14,000 doors and 11,000 windows, and its cost was 6,000,000 ducats. Its library, previous to the sack of the E. by the French in 1808, contained 30,000 printed and 4300 MS. volumes, mainly treasures of Arabic literature, of which a catalogue, but not a good one, was drawn up by Casiri in his *Bibliotheca Arabico-Hispanica* (2 vols., Madrid, 1760—1770). They were, however, at that time removed to Madrid; and on being sent back to the E., it was discovered that the library consisted only of about 20,000 volumes—a third of the whole having been lost. The French also plundered the place of its valuable collection of coins, medals, and pictures. The E. is now, says Ford, 'a mere shadow of the past,' and is only saved from going to ruin by grants of public money, which are occasionally made to keep it in repair.

ESCU'TCHEON, in Heraldry, is synonymous with Shield (q. v.).

ESCUTCHEON OF PRETENCE, or **INESCUTCHEON**, is a small shield placed in the centre of the larger one, and covering a portion of the charges on the latter, in which a man carries the arms of his wife when she is the heiress of her family. It is said to be carried *surtout*, or over-all. Sometimes also a shield over-all is given as a reward of honour; thus, the Earl of Stirling did bear two coats quarterly, and over-all an inescutcheon of Nova Scotia, because he was the first planter of it.—*Mackenzie, Heraldry*, p. 82.

E'SDRAS, Books of. (The word *Esdras* is the Greek form of Ezra, and indicates that the books so named do not exist in Hebrew or Chaldee.) In the Vulgate, the first book of Esdras means the canonical book of Ezra; and the second, the canonical book of Nehemiah; whilst the third and fourth are what we call the first and second books of Esdras. But in the Vatican and other editions of the LXX., what we call the first book of Esdras comes first, and is followed by the canonical book of Ezra, which is termed the *second* book of Esdras. In all the earlier editions of the English Bible, the order of the Vulgate is followed. The Geneva Bible was the first to adopt the classification now used, according to which Ezra and Nehemiah give their names to two canonical books, and the two apocryphal become first and second Esdras. As regards the *first* book of Esdras, it is for the most part a transcript—and not a very accurate one—of Ezra and a portion of Nehemiah, together with the two last chapters of 2d Chronicles. It is impossible to ascertain anything regarding its age or authorship. Josephus quotes it extensively in his Antiquities, even when it contradicts *Ezra* proper, a fact which indicates that it was highly valued by the Jews. It may perhaps be interesting to notice that the hackneyed phrase, *Magna est veritas et prevalebit* (Truth is great, and will prevail), is taken from the 41st verse of the 4th chapter of this book. The *second* book of Esdras, or Revelation of Esdras, is wholly different in character from the first, and it has even been doubted whether it is the work of a Jewish or of a semi-Christian writer. Lawrence and Hilgenfeld argue for its being composed 28—25 B.C.; Lücke, shortly after the death of Cæsar (44 B.C.); while Gfrörer, Bauer, and Wieseler assign it to a period as late as the reign of Domitian (81—96 A.D.). The opinion which has the weightiest evidence in its favour is, that the book was originally the composition of a Jew, but that it has been largely interpolated by Christian writers. The book was probably written in Egypt, and forms part of what has been called the 'Apocalyptic Cycle' of Jewish literature (see Revelation of St John). It consists of a series of angelic visions and revelations made to Ezra, regarding the mysteries of the moral world, and the final triumph of the righteous, who, however, are to be but 'a very few.' The descriptions are occasionally very striking, and even sublime, and if the doctrinal portions contain the original views of a man living before the apostolic era, the source of the Pauline phraseology can in part be discovered.

ESENBE'CKIA, a genus of trees of the natural order *Diosmaceæ*. The bark of *E. febrifuga* is said to be equal in its effects to Peruvian Bark. It is a tree forty feet high, a native of the south of Brazil.

ESK (Gaelic, *uisg*, water), the name of several small Scotch rivers. The Dumfriesshire Esk is formed by the confluence of the Black and White Esk, which rise on the borders of Selkirkshire, near Ettrick Pen, the centre of the Southern Highlands, and run each 10 miles south-south-east. The united stream runs 35 miles south, and forms for a mile the boundary between Scotland and England. For the last 8 miles it runs south-south-west in Cumberland, and finally falls into the head of the Solway Firth. It flows in a Silurian, Carboniferous, and Permian basin, through some charming scenery, past Langholm, Canobie, and Longton. The upper part of the valley of this E., which is wild and pastoral, is called Eskdale Muir.—The Edinburghshire North and South Esk rise in the north of Peeblesshire, between the Pentland and Moorfoot Hills, and both run north-north-east through a beautiful tract in the east of Edinburghshire, the north branch, 20 miles long, passing Roslin and Hawthornden, and the south branch 15 miles long. The two branches unite in Dalkeith Park, and run 3 miles north into the Firth of Forth at Musselburgh. The basin of the two streams is chiefly Carboniferous.—The Forfarshire North and South Esk. The North Esk rises in the Grampians, in the north of the county, and runs 25 miles south-east into the sea, 4 miles north of Montrose. At Ganachy Bridge it runs half a mile through a sandstone gorge 20 to 30 feet deep. In the lower half of its course it divides Forfarshire from Kincardineshire. The South Esk rises in the Grampians of the west of Forfarshire, and runs 40 miles south-east and east, crossing the valley of Strathmore. It passes Brechin, and ends in the tidal basin or lagoon of Montrose. The basins of both consist of gneiss, mica-slate, clay-slate, and old red sandstone.

E'SKI-DJU'MNA, a town of European Turkey, in the province of Bulgaria, is situated 20 miles west of Shumla. Lat. 43° 15′ N., long. 26° 35′ E. Pop. 6000.

E'SKI-SA'GRA, a town of European Turkey, in the province of Rumili, is situated at the southern base of the Balkan Mountains, 70 miles north-west of Adrianople. In the vicinity are numerous gardens and orchards, and also several mineral springs, which are in great repute. The manufactures are carpets, coarse linens, and leather. Pop. 15,000 to 20,000.

E'SLA, a river of Spain, and an important affluent to the Douro, rises in the province of Palencia, Old Castile, from the southern base of the Asturias mountains, 10 miles north-west of the town of Valleburon. Throughout the whole of its course, it flows south-west, and joins the Douro 15 miles below the town of Zamora. It is 125 miles in length. Its waters, which are joined by numerous streams, are well stocked with fish.

ESMERE'LDA (signifying *Emerald* in Spanish) denotes a river, a town, and a mountain-chain, all in America.—1. The river is in Ecuador (q. v.), rising near the city of Quito, and entering the Pacific after a course of 110 miles, in lat. 1° 5′ N., and long. 79° 40′ W.—2. The town stands 10 miles from the mouth of the river, containing about 4000 inhabitants.—3. The mountain-chain stretches about 170 miles east and west in Minas Geraes, an inland province of Brazil, about the middle of the length of the country.

ES'NÉ, E'SNA, or **E'SNEH,** the hieroglyphic *Sen*, and the Greek *Latopolis* or *Lattônpolis*—the city of the Latus fish or *Latus nobilis*, from the fish there worshipped—is a small and badly built town of Upper Egypt, and is situated on the left bank of the Nile, in lat. 25° 15′ N. The central portion of E. has edifices of coloured brick. It contains about 4000 inhabitants, of whom 1500 are Copts, and has some manufactories of blue cotton, and pottery. There are famous ruins at E., which consist of a sandstone temple, with a portico of four rows of six columns, which appears to have been founded by Thothmes III., whose name is seen on the jambs of a door. The temple, however, seems to have been restored or principally constructed by Ptolemy Euergetes (246—222 B. C.), and the pronaos was erected in the reign of the Emperor Claudius (41—54 A. D.), and completed in that of Vespasian. The interior is of the date of Trajan, the Antonines, and Geta, whose name, erased or replaced by that of Caracalla, is there found. The great temple was dedicated to Chnumis, Satis, and Har-Hek. It has a zodiac like that of Denderah, formerly thought to be of the most remote antiquity, but now known to be no older than the Romans. A smaller temple with a zodiac, erected in the reign of Ptolemy Euergetes, formerly stood at E'Deyr, 2½ miles north of E., but it has been destroyed. At E. is also a stone quay, bearing the names of M. Aurelius. This city was the capital of a nome, and the coins struck in it in the reign of Hadrian, 127—128 A. D., represent the fish latus.—Champollion, *Not. Descr.* p. 283; Wilkinson, *Mod. Egypt*, ii. p. 268; Tochon D'Annecy, *Médailles.*

ESO'CÏDÆ, a family of malacopterous fishes, which is now regarded as including only the Pikes (q. v.), but in which the flying fishes (*Exocoetus*) and other fishes, now constituting the family *Scomberasocidæ* (q. v.), and of the order *Pharyngognaths*, were until recently included.

ESOTE'RIC (Gr.) is a term derived from the ancient mysteries, in which it was applied to those doctrines that were designed for the initiated, in contradistinction to those that were imparted to the uninitiated, which were termed *exoteric.* It is now used in various relations of an analogous kind.

ESPA'LIER, a term borrowed from the French, and signifying a railing on which fruit-trees are trained as on a wall. Such railings are very variously constructed—sometimes of wood, sometimes of iron, sometimes of upright rails held together by a horizontal rail at top, sometimes chiefly of horizontal rails with upright posts for their support. Espaliers may be very conveniently and cheaply made of strong iron wire, sustained by upright iron or wooden posts, as in ordinary wire-fences. They vary in height from four to about eight feet, according to situation and the size of the garden. They have the advantage of securing the fruit in a great measure from the effect of winds, which often shake off great part of the crop of standard trees whilst still unripe: and from the full exposure to sun and air, excellent fruit is produced, although there is no reflected heat as from a wall, which is therefore still superior. Espaliers are very common in gardens in Britain, and add at once to the beauty and the productiveness of a garden, the ground not being overshadowed as by standard trees, although, of course, the roots of the trees render it unsuitable for many crops to some distance on both sides of the espalier. Espaliers are often used to separate flower-borders from plots occupied by culinary vegetables. Apples and pears are considered more suitable for espaliers than any other kinds of fruit trees commonly cultivated in Britain. The treatment is generally similar to that of wall trees, but the training is usually by horizontal branches. It is not unusual, when trees have become old and their branches thick and firm, to dispense with great part of the rails necessary in their earlier training.

ESPARTE'RO, JOAQUIN BALDOMERO, ex-regent of Spain, Count of Luchana, Duke of Vittoria, &c., was born in the year 1792, at Granatula, in La Mancha (Ciudad Real), where his father, Antonio Espartero, followed the occupation of a cartwright. E. was intended for the ecclesiastical profession, and in 1806 went to the university of Almagro, but two years later, on the invasion of Spain by the French, he entered the Sacred Battalion (*Batallon Sagrado*), so called from being composed almost entirely of students. After the close of the War of Independence in 1814, he went to South America, where he fought against the insurgents; but after the victory gained by Bolivar at Ayacucho, December 9, 1824, had put an end to the Spanish rule on the continent of America, E. returned to Spain. In 1832, he declared himself openly in favour of the succession of the daughter of Ferdinand VII.; and on the breaking out of the civil war after the king's death, he soon rose to the rank of lieutenant-general. In August 1836, he succeeded in saving the city of Madrid, and became successively general-in-chief of the army in the north, viceroy of Navarre, and captain-general of the Basque provinces. When the army of Don Carlos appeared before Madrid on the 12th September 1837, E. had again the glory of saving the capital. His successful campaign of 1839, which resulted in the expulsion of Don Carlos from Spain, procured him the title of Grandee of Spain, and Duque de la Vittoria y de Morella. In 1840, the queen-mother Christina was compelled to resign her office of regent, and on the 8th of May 1841, E. was appointed by the Cortes to supply her place until the queen (Isabella) should have reached her majority. E. guided the helm of the state with energy, firmness, and ability; but in 1843, an unscrupulous and unprincipled combination of parties naturally inimical to each other, the Republicans and the Moderados, brought about his fall. E. sailed for England, where he resided for four years. In 1847, he returned to Spain, and lived quietly at Logroño till 1854, when the wretched despotism and profligacy with which the name of Christina is associated, caused an insurrection of the people, and compelled the queen-mother to leave the kingdom. E. was again called to the head of the government, and conducted the affairs of the nation for two years; but in July 1856, he was supplanted by General O'Donnell. Since then, E. has taken no part in political agitation. E.'s career has shewn that he is not astute enough to manage parties. An honest man, a gallant soldier, and a sound-headed constitutionalist, he has, nevertheless, not exhibited that tact and foresight which are necessary to all politicians, but especially to those of Spain—the land where the progress of liberty and knowledge is circumvented at every step. Compare J. S. Florez, *Espartero Historia de sa Vida Militare y Politica* (3 vols., Madrid, 1843—1844).

ESPA'RTO (*Stipa* or *Macrochloa tenacissima*), a grass nearly allied to the well-known and beautiful Feather-grass (q. v.), a native of the south of Europe, and particularly abundant in some parts of Spain. It is much used by the Spaniards for making sandals, mats, baskets, ropes, nets, sacks, &c., for which it is adapted by the great strength of its fibre.

ESPE'JO, a small town of Spain, in the province of Cordova, and 20 miles south-east of the town of that name, is situated on the slope of a hill. It is comparatively well built, with wide and regular streets. It has an ancient castle of the Duke of Modena Celi. E. has some manufactures of linen and woollen goods, and some trade in grain, cattle, and wool. Pop. 5284.

ESPINASSE, JULIE JEANNE ELEONORE DE L', one of the most fascinating women of her time, and one who combined sparkling gifts with a heart susceptible of the strongest affections, was born at Lyon, 19th November 1732, and was the illegitimate daughter of a Madame d'Albion. After the death of her mother, Mademoiselle de l'E., who had received an excellent education, went to live at the house of her brother-in-law, the Marquis de Vichy-Chamroud, in whose family she held the position of *gouvernante*. In 1752, she left her brother-in-law's house, and went to Paris in the quality of *demoiselle de compagnie* to the Marquise du Deffand (q. v.). The two ladies lived together for a time most agreeably, until it became evident that the charms of the young and beautiful *demoiselle* had enlisted on her side the admiration of the circle in which Du Deffand had formerly been the chief attraction. Even D'Alembert, the famous encyclopédist, who hitherto had been the most constant admirer of Du Deffand, now manifested an entire devotion to the younger and more fascinating Espinasse. A rupture between the ladies was the consequence. The friends of E., however, obtained for her, through the Duc de Choiseul, an annuity from the king. It is said that D'Alembert sought her hand in vain. She died 23d May 1776. Her *Lettres*, &c. (Paris, 1809) bear witness to her remarkable cultivation.

ESPINEL, VINCENT DE, a Spanish poet and musician, was born at Ronda in Granada, 28th December 1551. He studied at Salamanca, afterwards entered into the army, and travelled as a soldier through a great part of Spain, France, and Italy, meeting with the adventures which he relates in his *Relaciones de la Vida y Aventuras del Escudero Marcos de Obregon* (Madr. 1618, later 1804; in German, by Tieck, Bres. 1827). He afterwards returned to his native country, entered into holy orders, and received a benefice in Ronda, his native town. He was subsequently chaplain in the royal hospital at Ronda. The last years of his life were spent at Madrid, in the retirement of the monastery of *Santa Catalina*, where he died in 1634. He published a book of poems (Madr. 1591), containing chiefly lyrics, and a translation of the *Epistola ad Pisones*, the *Ars Poetica* of Horace. He was, if not the inventor, the improver of the ten-line octosyllabic stanza. Verses written in this form have, since E.'s day, been called in Spain *Espinelas*. He was a performer on the guitar, to which he added the fifth string.

ESPINHA'CA (SERRA DO), a mountain-chain of Brazil, extends in a direction generally parallel with the coast, from the right bank of the San Francisco to the head-waters of the Uruguay. Its northern part forms the eastern limit of the basin of the former river. The Serra, as a whole, is said to be rich in diamonds.

ESPI'RITU SA'NTO, besides having been long applied by the Spaniards to their imaginary continent in the southern hemisphere, denotes various actual localities.—1. E. S. is a small maritime province of Brazil, extending in S. lat. from 18° 30' to 21° 20', and lying immediately to the north of the metropolitan province of Rio Janeiro. This province contains also a town and a bay of its own name.—2. E. S. is the largest and most westerly island of the New Hebrides, being in lat. 15° S., and long. 167° E. It is said to measure 65 miles by 20.—3. E. S. is a cape of Tierra del Fuego, in lat. 52° 38' S., and long. 68° 37' W.—4. E. S. is a considerable town near the centre of Cuba. It contains about 9982 inhabitants, fully one-half being whites.—5. E. S. is a bay of the Gulf of Mexico, forming part of the almost continuous back-water of Texas. It is in lat. 28° 30' N., and long. 97° 30' W. Towards the open sea, it is breasted by Matagorda Island, and on the side of the mainland, it receives the Guadaloupe.

ESPLANA'DE (in Fort.) is the open space intentionally left between the houses of a city and the glacis of its citadel. It requires to be at least 800 paces broad, that the enemy, in case of his getting possession of the town, may not be able to assail the citadel under cover of the nearest houses. For this purpose, the citadel must command the esplanade, and be able to send a direct fire into the streets opening upon it. In old works on fortification, the term is often applied to the glacis of the counterscarp, or the slope of the parapet of the covered way towards the country.

ESPRINGAL, or **SPRI'NGAL**, in the military engineering of the days before the introduction of gunpowder into European warfare, was a machine for throwing missiles. These missiles were either large darts called *muchettes*, or arrows winged with brass, and called *viretons*, from their whirling motion when shot forth. The espringal probably resembled in some degree the machine engraved in BALISTA.

ESPRIT D'IVA, an aromatic liqueur made in Switzerland, from a plant called GENIPI (*Achillæa moschata*, or *Ptarmica moschata;* see ACHILLÆA). Like the *Swiss tea*, made from the same plant, it possesses sudorific properties.

ESPY, JAMES P., one of the most original and able meteorologists of the present century, was the son of a farmer in Western Pennsylvania, where he was born in 1784 or 1785. He received a superior education, and, during the earlier part of his career, was one of the best classical and mathematical instructors in Philadelphia. E.'s attention was first strongly turned to science by the writings of Dalton and Daniell on meteorology. After some time, his enthusiasm became so great, that he resolved to give up teaching, and to rely for the means of prosecuting his meteorological researches upon his slender savings and the success of his lectures on the subject, which, fortunately, turned out to be far more attractive than the average of popular lectures. His first course was delivered before the Franklin Institute of Pennsylvania. E.'s theory of storms (with which his name is specially connected) drew general attention to itself, especially in the United States. See STORMS. A memoir on this subject gained for him, in 1836, the Magellanic premium of the American Philosophical Society of Philadelphia. In 1841 appeared his work on the *Philosophy of Storms*, regarding which the Report of the *Académie des Sciences* (Paris) says, 'that the theory on which it is based alone accounts for the phenomena. . . . . . In a word, for physical geography, agriculture, navigation, and meteorology, it gives us new explanations, indications useful for ulterior researches, and redresses many accredited errors.' Later in his life, E. became Professor in the Philadelphia High

School, and afterwards in the Franklin Institute of that city. He travelled extensively through the United States, lecturing on his favourite theory of storms, and studying the laws of climate, until he acquired the popular title of the 'Storm-king.' After the organisation of the Smithsonian Institution at Washington, he was commissioned by Dr Henry, its superintendent, to pursue his researches. It was in the halls of the Smithsonian that his experiments on the rate of cooling of gases of different densities when expanded were made. The cooling effects of expansion on dry and moist air also formed the subject of nice experiments. The results of these experiments have thrown much light on the formation of cloud and rain, and the propelling power of winds. They afforded materials for his elaborate and valuable reports on meteorology, presented to the senate of the United States. Four of these reports were published at the expense of government. The last was issued in 1857, which embodies all his matured opinions on meteorological phenomena. This is by far the most valuable work on the principles of the science at the present day. He died in Cincinnati, Ohio, 24th January 1860, at the residence of his nephew.

E'SQUIMAUX, or **ESKIMOS**, is the name of a nation inhabiting the coasts of all the seas, bays, inlets, and islands of America north of the 60° of N. lat.; from the eastern coast of Greenland, in long. 20°, to the Strait of Behring, in long. 167° W. On the Atlantic, they are to be found along the entire coast of Labrador to the Strait of Belle-isle, and down the east side of Hudson's Bay nearly as far as James's Bay; while on the Pacific they reach as far as the peninsula of Alaska. They are also to be met with on the Asiatic side of Behring's Strait, and though few in number, may be regarded as the most widely spread nation in the world, occupying, according to Mr Gallatin, not less than 5400 miles of coast, without including the inlets of the sea. 'The Eskimo,' says Dr Latham, 'is the only family common to the Old and New World—an important fact in itself, and one made more important still by the Eskimo localities being the only localities where the two continents come into proximity.' Nothing, however, has as yet come out of a consideration of this fact in the way of tracing, with absolute certainty, a connection between the E. and any well-defined Asiatic race. The name itself, *Esquimaux* or *Eskimo*, does not help us in any such attempt, being from an Algonquin or Abenaki word, signifying 'eaters of raw flesh.' This is not the native name, for they call themselves 'Inuit,' or 'people;' the Scandinavians of the 10th c. called them 'Skroellingar,' or 'wretches;' while the seamen of the Hudson's Bay ships designate them as 'Seymos,' or 'Suckemos'—appellations, according to Richardson, 'evidently derived from the vociferous cries of Seymo or Teymo with which the poor people greet the arrival of the ships.' The E. are usually reckoned by ethnologists to belong to the Mongolian race, but Duponceau and Gallatin find a strong resemblance between them and the Red Indians of North America, which is the view also taken by Prichard—the last mentioned regarding them as a kind of link between the Northern Asiatic and American family of nations. Latham, on the other hand, pronounces them to be Mongolian in physiognomy, with flat nose, projecting cheek-bones, eyes often oblique, and skin more brown than red or copper coloured; thus presenting a marked contrast to the North American Indians. Their language, however, is, he acknowledges, American in respect to its grammatical structure, being composed of long compound words, and regular, though remarkable, inflections. With respect to the complexion of the E., Sir John Richardson is of a different opinion from any of these authors, describing it as nearly white, when relieved from the smoke and dirt with which it is usually incrusted. Many of the young women, he considers, may even be called pretty, when this operation has been performed. 'The young men,' he says, 'have little beard; but some of the old ones have a tolerable show of long gray hairs on the upper lip and chin, which the Red Indians never have, as they eradicate all stray hairs. The Eskimo beard, however, is in no instance so dense as a European one.' In stature, the E. are usually represented as not being more than five feet in height; but the authority just mentioned describes them as ranging from five feet to five feet ten inches, and even more. They are broad-shouldered, and, when seated in their boats, look tall and muscular, but, when standing, appear to lose some of their height, from the shortness of their lower extremities. The E. live usually throughout their long lines of coast in small villages, containing about five or six families each. The men occupy themselves entirely in hunting, while the women perform the domestic drudgery, which consists principally in preparing the food, of which both sexes consume a large quantity. This is almost entirely of an animal nature, but not without variety, embracing the reindeer, geese and other birds, the seal, walrus, salmon-trout, and various other kinds of fish. They are expert hunters and fishers, and, aided by their dogs, make considerable havoc among the arctic animal tribes. Where whales are common, August and September are devoted to the pursuit of these animals, and great joy is manifested when they capture any of them, as from the blubber of these they get their supply of oil for lights in the long winter season. Of vegetables, they scarcely taste any except in the autumn. 'Carbon is supplied to the system by the use of much oil and fat in the diet, and draughts of warm blood from a newly killed animal are considered as contributing greatly to preserve the hunter in health.' The habits of the E. are filthy and revolting in the extreme. A great part of their food is consumed without any attempt at cooking it, and they drink the blood of newly killed animals as the greatest delicacy that could be offered them. In the short summer, those who can afford it live in tents; but in the winter they all equally live in snow-huts, the stench of which, from the offal with which they are stored, and the filthy oil that gives them light, makes them insupportable to the European. The dress of both sexes is nearly the same, consisting of the skins of animals, reindeer, birds, and even fish—whatever conduces most to warmth, without much regard to appearance; but in their winter abodes they usually wear nothing except trousers. Their religion consists principally in superstitious observances, but they believe, we are told, in two greater spirits, and many lesser ones. The Moravian mission in Greenland, commenced by the benevolent Hans Egede (q. v.), in 1721, has succeeded in converting many of them to Christianity; and they are represented by the missionaries to be a mild and teachable people, easily led by kindness to distinguish between what is morally right and wrong. Where the missionaries, however, have not penetrated, our arctic voyagers generally speak of them as honest among themselves, but incorrigibly dishonest, and prone to lying and exaggeration, in their intercourse with strangers.

ESQUIMAUX DOG, a kind of dog extensively spread over the most northern regions of North America and of Eastern Asia; large, powerful, with long rather curling hair, tail much curved over the back and very bushy, short and pointed ears, and somewhat wolf-like aspect. These dogs are much used for drawing sledges. They are very sagacious, docile, and patient. The colour is generally black and white, brown and white, or dingy white.

Esquimaux, Dogs, and Sledge for one person.

ESQUI'RE (Fr. *escuier*, a shield-bearer, from Lat. *scutum*, a shield). The esquire in chivalry was the shield-bearer or armour-bearer to the knight, and hence was called *armiger* in Latin. He was a candidate for the honour of knighthood, and thus stood to the knight in the relation of a novice or apprentice, pretty much as the page did to him. In this capacity he was spoken of as a bachelor, just as the knight-bachelor came latterly to be distinguished from him who had already attained to the higher honours of chivalry. When fully equipped, each knight was attended by two esquires. The esquire was a gentleman, and had the right of bearing arms on his own shield or escutcheon, which is surmounted by a helmet placed sideways, with its vizor closed, to distinguish him from a knight or nobleman. He had also the sword, the emblem of chivalry, though he was not girded with the knightly belt. His spurs were silver, to distinguish them from the golden spurs of the knight; and when the king created esquires of old, it was by putting silver spurs on their heels, and collars of S. S. round their necks. Those who received this honour directly from the sovereign were in general the esquires for the king's body, or those whose duty it was to attend him in his capacity of a knight; an office now nearly obsolete. Tenants of the crown who held by knight's service were a class of feudal esquires generally supposed to correspond to the simple *ritters* or knights of Germany, as opposed to the *ritters* who were *geschlagen* or dubbed, inasmuch as these English esquires were entitled to claim the rank of knighthood. Though the title of esquire has now come to be given without discrimination to all persons above the rank of a tradesman or shopkeeper, the following seem to be those whose claim to it stands on the ground either of legal right or of long-established courtesy: 1. All the untitled sons of noblemen; 2. The eldest sons of knights and baronets; 3. The sons of the younger sons of dukes and marquises, and their eldest sons. All these are esquires by birth. Then there are esquires by profession, whose rank does not descend to their children; and esquires by office—e. g., justices of the peace—who enjoy the title only during their tenure of office. To the former class belong officers in the army and navy, barristers and doctors of law, and doctors of medicine, but not surgeons.

ESQUIROL, Jean Etienne Dominique, one of the greatest physicians for the insane of modern times, was born at Toulouse, 4th January 1772. He served in the military lazaretto at Narbonne in 1794, obtained his degree of Doctor in 1805, and was appointed physician to the Salpêtrière at Paris in 1811. After 1817, he delivered clinical lectures on the diseases of the mind, and their cures; in 1818, his exertions secured the appointment of a commission, of which he became a member, for the remedy of abuses in mad-houses; in 1823, he became inspector-general of the University; and in 1825, first physician to the *Maison des Aliénés*. In the following year, he was also appointed principal physician of the Private Lunatic Asylum at Charenton, which he had organised with admirable skill. At the July revolution, he lost all his public offices, and withdrew into private life. He died 12th December 1840. E. combined, in a truly rare and wonderful manner, the qualifications requisite for a physician of the body and a physician of the mind. By his humane and moral treatment of the insane, he often effected the happiest cures. His writings embrace all the questions connected with the treatment of insanity. E. also paid great attention to a very important subject, viz., the construction of suitable buildings for the insane; and most of the modern lunatic asylums in France, such as those of Rouen, Nantes, and Montpellier, have been built according to his suggestions and advice. His most important work is *Des Maladies Mentales considérées sous les Rapports, Médical, Hygiénique et Médico-légal* (2 vols., Paris, 1838).

ESQUIROS, Henri Alphonse, a poet and romancist of France, a late representative in the Legislative Assembly, was born at Paris in 1814. He made his literary *début* as an author in 1834, when he published a volume of poems, entitled *Les Hirondelles*, which although highly praised by M. Victor Hugo, had but a very limited sale. *Les Hirondelles* was followed by two romances, *Le Magicien* (1837) and *Charlotte Corday* (1840). About this time he also published a philosophic and democratic commentary on the life of Christ, under the title of the *Evangile du Peuple* (1840). For the publication of this work, E. was prosecuted, and sentenced to eight months' imprisonment and to a fine of 500 francs, 30th January 1841. In the same year he published his *Chants d'un Prisonnier*, written in prison. He also wrote three little works between 1841 and 1842—these were *Les Vierges Martyres*, *Les Vierges Folles*, and *Les Vierges Sages*. His *Histoire des Montagnards* appeared in 1847.

After the revolution of February 1848, E., whom his writings, and the prosecutions of which they had been the object, recommended to the extreme party, was elected a member of the Legislative Assembly. Distinguished by his radical opinions, he was included, after the 2d December 1851, among the number of members to be expelled; on which he retired to England. His *La Vie Future au Point de Vue Socialiste* appeared in 1857; and his *La Morale Universelle*, his *L'Angleterre et la Vie Anglaise*, and his *La Neerlande et la Vie Hollandaise* in 1859; the last of which has been translated into English by Lascelles Wraxall, and is just published (November, 1861) by Chapman and Hall, under the title of *The Dutch at Home*.

ESSAAD-EFFENDI, Mohammed, a Turkish historian, was born at Constantinople, 16th December 1790. He is surnamed Sahaf-Zadeh, 'son of the bookbinder,' on account of his father having been president of a corporation of bookbinders and librarians. At the age of 18, he became a teacher; in 1825, he was appointed historiographer to the Ottoman empire. In 1831, the superintendence of the

Tatawin-i-wekaii (Table of Events), the official journal of the empire, was placed in his hands. In 1835, he was employed by the late Sultan Mahmoud on an embassy to Mohammed, the son and successor of the king of Persia. E. has also the titles of Grand Judge of Roumelia, Inspector-general of Schools, and member of the Council of Public Instruction.

The works of E. comprise, among others, the *Uss-i-Tzafer* (the Establishment of Victory), a work which has been translated into French, and published by M. Causin de Perceval, with the following title: *Historic Summary of the Destruction of the Janizaries by the Sultan Mahmoud in* 1826 (Par. 1833).

E'SSEN, a town in Rhenish Prussia, situated between the Rhur and the Emscher, 20 miles north-east of Düsseldorf, stands in the midst of a rich coal and iron district. The town is surrounded by the high chimneys of the steam-engines used in working the mines. As it has risen only very recently to its present importance, its architectural beauties are not great; it has, however, an imposing cathedral, containing many curious reliquaries, crosses, &c. E. owes its prosperity to the inexhaustible coal-mines in its vicinity. In 1856, E., with Werden, a small town in the immediate neighbourhood, produced 36,160,650 bushels of coal, one-sixth of which was sent to Holland. In the neighbourhood are great ironworks, a steel manufactory, containing 9 steam-engines, 150 furnaces, employing 900 workmen; an iron-foundry with 300 workmen; also extensive establishments for making machines and manufacturing zinc; with copper-mills, steam-mills, and manufactures of cloth and paper. Pop. 12,963. Although the industrial activity of E. is only of recent growth, the town itself is very old, and can trace its origin to the famous Benedictine nunnery of the same name, founded as far back as 873 A. D.

ESSENCE DE PETIT GRAIN is obtained by distillation from small unripe oranges, about the size of a cherry, and is used as a perfume in the same manner as *Orange-flower Water*.

E'SSENCES are solutions of the essential oils in alcohol, and may be prepared (1) by adding rectified spirit to the odoriferous parts of plants, or to the essential oils, and distilling; or (2) simply by adding the essential oil to the rectified spirit, and agitating till a uniform mixture is obtained. Thus the essence of lemons is merely a solution of the volatile oil of lemons in rectified spirit.

ESSE'NES (*Essēnoi, Essaioi*), a small religious fraternity among the Jews, whose name and origin, as well as character and history, are alike involved in obscurity. Still, in the wide field of the history of the Semitic religions, there are not many subjects of inquiry of greater importance, or calculated to inspire a deeper interest. The Essenes bore one of the most momentous parts in the development of Judaism. Christianity stands in so close connection with them, that John the Baptist and Christ himself have been pronounced to have originally issued from their ranks. More surprising than all, out of Essenism, in the stage of Sabæism, has sprung Islam itself, and in this last development of its tenets and practices are still preserved some of its principal rites. It is but natural that from the days of the Fathers to our own, an infinite number of writers, more or less qualified for the task, should have endeavoured to throw light on this mysterious brotherhood, but with success far from satisfactory. The reason of this is obvious enough. Josephus, Philo, Pliny, Solinus, Eusebius, and the Fathers generally, were considered the sources, and the only sources, from which the genuine history of this fraternity could be deduced. Of these, Pliny indeed has a geographical notice, which cannot be traced to either Philo or Josephus; but the rest have so evidently derived their shallow and contradictory accounts indirectly, and through corrupted channels, from those two writers, that they lose all claim to consideration. Of the two books of Philo in which information regarding the Essenes is contained, one (*De Vita Contemplativa*) is proved to have been written about three centuries after Philo's death by a Christian monk as a panegyric on ascetic monachism. The other (*Quod Omnis*) is, to say the least, of doubtful genuineness, and is, moreover, at variance with Josephus. As to Josephus himself, it is now pretty generally allowed that his Essenes stand in much the same relation to the historical Essenes as the ideal inhabitants of the *Germania* of Tacitus stand to the real Germans of his time. Strange that for so many centuries the real and genuine sources—the Talmudical writings—should never have been thought of. These, *together* with Josephus and Philo, Pliny, and the Arabians Macrisi and Abulfarag, will perhaps better enable us to form an idea, not only of the real state of this community, but, what is of no less moment, to trace the process by which they gradually arrived at their peculiar mode of life and worship. We need not remind the reader that we must strictly confine ourselves here to an epitome of facts and conclusions.

We have to premise, that exception must at the outset be taken to the opening statement of Josephus, that there were three different 'sects' among the Jews: the Pharisees, the Sadducees, and the Essenes—a statement which has been copied and accepted from that day to the present. The Sadducees were a political party, nothing more or less, and, as a matter of course, held religious views antagonistic to, or rather they did not accept the traditions of, their adversaries, the Pharisees, who, again, forming as they did, the bulk of the nation, cannot rightly be called a *sect*. Least of all were the Essenes such. They were Pharisees of stronger convictions, and carried out the Pharisaic views with a consistency which made them ridiculous even in the eyes of their own mother-party (Sota, 26, a.); neither were they known by the names of Essenes, this being a very late designation, derived either from a Chaldee word *Sacha*, and meaning Bathers, or Baptists; or from *Asa*, meaning Healers. The Mishna, Beraitha, and Talmud speak of these advanced Pharisees in general as Chasidim (*Assidaioi*, Pious Men), Nazirim (Abstinents), Toble Shachărith (Hemerobaptists), Banai (Builders), and Chaberim (Friends). The Arabic book of *Maccabees* calls the Essenes simply *Assidaioi*, and Macrisi speaks of 'Nazirs, Essenes, and Baptists' as *all* being 'Asaniun,' or Essenes.

The Nazirhood, a kind of voluntary priesthood, enjoining abstinence from wine, flesh, and other sensual enjoyments, had, in the troublous times of anti-Syrian agitation, and the general upheaving of society, found numerous adherents (*Tosifta Nazir*, c. 4; *Talm. Babli Berach.* 48, a. 1; *Macc.* ii. 49; Jos. *Antiq.* xviii. 1); and gradually there sprang up (contrary to the Bible, which restricts this asceticism to a certain period) a host of men calling themselves 'Nazirs for ever'—Nazire olam (*Nazir*, 4, a.). Pharisees of a spiritual and contemplative bias, with no natural taste for the conflicts and activity of political or public life, or wearied, perhaps, with the vanity of human aims, took this vow of Nazirship for life, and constituted themselves into a sort of religious club. Levitical purity in its strictest and highest sense made them draw closer and closer the innumerable '*fences*' which the traditional law had erected round the biblical law.

Any one, friend or foe, could, at any moment, by having touched something impure, disturb this purity for the time, and necessitate new and endless purifications. Thus it became necessary, or at least expedient, that those among them who could break all ties of friendship and family, should retire into a solitude not easily approachable by a stranger to their community. Food, again, could not be prepared save by those of the brethren who knew and strictly obeyed the hyper-traditional injunctions. Their dress, every implement of daily use, had to be made under similarly stringent laws of purity. A natural consequence of this their exalted notion of outward priesthood, was—the different phases of woman's life taken into consideration—their general celibacy. (The explanation given by Josephus—the fear of the corruption of both towns and women—is entirely gratuitous, and utterly in discordance with the Jewish notions of the time.) In this state of voluntary isolation, trading was out of the question; they tilled the ground, and lived on the fruits of the earth. Taking their meals, and these of the coarsest and plainest description, in common, they idealised the table into an altar, and, prayer having been said, they remained standing silently round it during the repast. That they had no individual property, follows of course, and their communistic motto, which the Mishna (Aboth) has preserved to us—'Mine is thine, and thine is mine'—explains itself. We need not enlarge further on their small eccentricities—on the white linen garment, the apron (kenaphaim), the scoop or shovel; they are one and all, signs and symbols of Levitical purity, the scoop reminding us of a certain Mosaic ordinance during the wanderings in the desert, the apron becoming necessary from the frequent ablution of their hands. Every morning, they bathed, like the priests who ministered in the temple, in pure spring water. They abhorred blood as a source of impurity, and for this reason, probably, some of them abstained also from going up to the temple, where sacrifices were daily offered; others we find present at a festival in the temple (Succah, 51, 53). Their offerings were sent alive under the care of messengers. But these were but outward signs of purity, stepping-stones to inner piety, to communion with God, which was only to be acquired, according to their notion, by solitude and an ascetic life. The belief in the efficacy of the most rigid simplicity and willing self-sacrifice, they held in common with the Pharisees; their horror of oaths, their frequent prayers, their occupation with mystical doctrine, were their own. Untroubled by the noise of war or the strife of parties, leading a life divided between the bath, ablutions, contemplation, and prayer; despising the body and bodily wants; what more natural than that by degrees they should be led into a kind of mystical enthusiasm and fanaticism. They allegorised, they symbolised; and their efforts culminated in seeing the unseen. Absorbed in the attempt to fathom the mysteries of the nature of God, one of their principal occupations was the study of the name of God; of that unpronounceable name which only the High-priest dared utter once a year in the Holy of Holies during the most awful and solemn service on the Day of Atonement. The knowledge of that name in four, in twelve, and in twenty-four letters, would give them the power of prophecy and of 'receiving the Holy Ghost.'

Angelology, derived from the Magi, formed a prominent feature of their creed. In course of time, they were looked upon by the vulgar as saints and workers of miracles. A wonderful book of cures (*Sepher Refuoth*), which Talmudic, Arabic, and Byzantine authorities alike ascribe to Solomon, was in their hands, and with this, 'by the aid of certain roots and stones,' by the imposition of hands, and certain whisperings—a practice strongly condemned by the Pharisees (Synhedr. 90, a.)—they cast out demons, and healed the sick. Philosophy they regarded in so far only as it treated of the existence of God. Jehovah is the original light; from Him proceed a number of spirits (the Platonic Ideas), and at their head stands the Wisdom, or *Logos*, into which, after death, the soul is again absorbed. Their code of Ethics was threefold—the love of God, of virtue, and of man; their scale of perfectibility reaching its acme in the communion with the Holy Ghost (*Ruach Hakodesh*), (Mishn. Sota, 99). In fine, mixing up, in the strangest manner, the most exalted and the most puerile notions, they became the forerunners of the Christian Gnostics and of the Jewish Cabbalists, and, it may be, of many secret, still existing orders, who may have derived from this source their ceremonies and the gradations of initiation.

They seem never to have numbered more than 4000, including even those Nazirs or Essenes who remained in their own families. Their colony appears to have been established chiefly near the Dead Sea, and it is undoubtedly this colony which has served Josephus as a basis to his romantic Essene republic. But, however distant from each other they might be, a constant intercommunication was kept up through a body of delegates, or angels (Malachim). As they had sprung from the Pharisees, so they again merged into them—part of them, we should rather say; the remaining part became Therapeutæ, or Christians. See Therapeutæ and Jewish Sects. The Talmud gives a distinct account of their ceasing to exist as a separate community (Bechorot, 27), and so soon after their extinction did they fall into oblivion, that in the third century we find a Jewish Sage asking who *these Hemerobaptists* had been (Berachot, 22, 1).

Much has been written and said of a certain literature which they possessed; on this we are unable to decide, deprived as we are of all trustworthy authority. One fragment only remains; it is quoted in the Talmud (Jerusch. Berachoth. End) in the following words: 'It is written in the book of the *Chasidim*, If thou leavest it (the divine law) for one day, it will leave thee for two.'

In addition to the Talmud and Midrash, we refer the reader to Joseph. *Antiq.* xv. 10, xviii. 1; *Jew. War*, ii. 7, 8; Philo, *Quod Omnis Prob. lib.* § 12; Plinius, *Hist. Natur.* v. 17; Epiphan. *Hæres.* xxix.; Hieron., Cyrill., Chrysost., &c. Beckermann, *Geschichtl. Nachr. aus dem Alterth. über die Ess.*, &c. (Berl. 1821); Grätz, *Gesch. d. Juden* (Leip. 1856); *Frankel* in *Zeitschr. für die Relig. Inter.*, &c., iii. (Berl. 1844), &c.; and *Monatsschr, Für Gesch. und Wissensch.*, &c. ii. (Leip. 1852), &c.; Sprenger, *Leben u. Lehre Mohammads* (Berl. 1861).

ESSE'NTIAL OILS. See Oils.

ESSEQUI'BO, the most westerly of the great rivers of British Guiana, enters the Atlantic near the territory of Venezuela, in lat. 7° N., and long. 58° 40′ W. It forms, at its mouth, an estuary of twenty miles in width; and it is favourably distinguished from the Demerara and the Berbice by the absence of a bar. It appears to excel the other streams of the country as well in length and volume as in its navigable facilities, and to be practicable for large ships up to its first falls—a distance of 60 miles from the sea. The greater part of its course of 450 miles is through forests of the most gigantic vegetation. Its basin, speaking generally, corresponds with the county of the same name. This subdivision of the colony is inferior, unless in purely natural resources, to either of the two others in value and importance—Demerara and Berbice respectively containing the principal settlements, George Town and New Amsterdam.

E'SSEX, a maritime county of the south-east of England, having the North Sea on the E.; the Thames estuary, dividing it from Kent, on the S.; Middlesex and Hertford on the W.; and Cambridge and Suffolk on the north. Its greatest length from north-east to south-west is 63 miles, and the greatest breadth from east to west is 54 miles. It has 1,060,549 statute acres, nine-tenths being arable or in grass, and a twentieth in wood. The surface towards the Thames and sea is flat, marshy, and broken into peninsulas, creeks, and islets. The coast-line is 85 miles long. Some of the marshes extend four or five miles inland. At one part, two to two and a half miles' breadth of sand is dry at low water. Some cliffs at the Naze are 35 feet high. The centre and north of the county are beautifully diversified and richly wooded, the highest point being Langdon Hill, 620 feet above the sea. Besides the Thames, the other chief rivers are the Stour, 50 miles long; Blackwater, 46 miles; Lea, Roding, Crouch, and Chelmer. The east of the county is mostly on London clay, with limestone beds near Harwich. In the north-west, chalk appears. In the middle and north, there is much diluvium, with chalk fragments. Crag occurs near Norwich, and stones of phosphate of lime are found here and there. The climate is moist on the coast, but clear, healthy, and with little rain in the interior. There are frequent cold fogs in spring and autumn. The soil is mostly a fertile loam on marly alluvium. The county is almost wholly agricultural. The chief crops are wheat, barley, oats, beans, potatoes, saffron, caraway, and hops. Essex wheat is superior. Great numbers of calves are fattened for the London market, and there are large sheep-flocks. E. has valuable oyster-fisheries and silk-manufactures. Pop. in 1861, 404,644; in 1851, 369,318, with 766 places of worship (443 Church of England, and 134 Independents). E. returns four members to parliament. The chief towns are Chelmsford, the capital, Colchester, Maldon, and Harwich. E. was once forest-land, and the seat of a powerful tribe, the Trinobantes, whose famous chiefs, Caractacus and Boadicea, were overthrown by the Romans. E. constituted part of the Roman *Flavia Cæsariensis.* It has afforded many Roman remains, and a Roman road once passed through Colchester, which was an important Roman station. The Saxon kingdom of Essex or East Sexe (527—823), included London and parts of Middlesex, Hertford, Bedford, and Essex.

ESSEX, ROBERT DEVEREUX, EARL OF, son of Walter Devereux, first earl of E., was born at Netherwood in Herefordshire, 10th November 1567; entered Trinity College, Cambridge, at the age of ten, where he remained for four years. Lord Burleigh, to whose guardianship he had been intrusted, introduced the handsome and gifted youth at court in 1584. Here, by his agreeable manners, his appearance, and talents, he established himself among troops of friends, and gained the special favour of Elizabeth. In 1585, he accompanied the Earl of Leicester to Holland, where he distinguished himself at the battle of Zutphen, and on his return to England was made Master of the Horse and Knight of the Garter. After the death of Leicester, E. continued to rise in the favour of Elizabeth, who loaded him with honours. In 1591, he commanded the forces sent to the assistance of Henry IV. of France against the Spaniards, but achieved no success. The next few years were spent in endeavouring to get the better of Burleigh—the wisest, the most prudent, and the most politic of all Elizabeth's advisers. In 1596 he was appointed joint-commander with Lord Howard in the expedition against Spain, to which Burleigh was strongly opposed; and though E. displayed all his wonted courage, and contributed to the capture of Cadiz, which caused immense loss to the Spaniards, yet the expedition resulted in nothing, and E. had to defend himself against various accusations on his return. In 1597, he was made Earl Marshal of England, and, on the death of Lord Burleigh, Chancellor of Cambridge. In 1598 occurred the first fatal mistake in E.'s career. Presuming upon Elizabeth's admiration and feminine fondness for his person, he differed from her about some trifling matter, and angrily and rudely turned his back upon her in the presence of some of the council, and her majesty, whose language was hardly more delicate than her father's, gave him a vigorous box on the ears, telling him to 'go and be hanged.' A violent quarrel ensued, which, though apparently smoothed up, was never really so. E. was afterwards, in 1599, sent to Ireland—part of which at that time was in a state of rebellion—as lord-lieutenant of that country; but here his government was ill-advised and ineffectual, and after a few unimportant undertakings, he concluded a truce with the rebels, which was regarded at court as high treason. In order to confront his enemies, he hastened back to London, contrary to the queen's express commands, and forced his way into Elizabeth's bedchamber. Justly offended, the queen deprived him of his dignities, and commanded that he should be called to account for his behaviour. E., advancing from one degree of foolhardihood to another, tried to excite an insurrection in London. He was imprisoned, tried, and found guilty. Elizabeth long delayed signing the warrant for his execution, in the hope that he would implore her pardon. He was beheaded on the 25th February 1601, after defending himself with pride and dignity. E. was rash, bold, and presumptuous; but brave, generous, and affectionate, and the friend and patron of literary men.

ES-SIOUT. See SIOUT.

E'SSLINGEN, a manufacturing town of Germany, in the kingdom of Würtemberg, is situated near the right bank of the Necker, in the centre of a pleasing and fertile district, seven miles east-south-east of Stuttgart. It consists of the town proper, and five suburbs, and is surrounded by strong walls, and fortified by towers. The chief buildings are the *Frauenkirche*—a splendid edifice in the purest Gothic style, built in 1440, and surmounted by a spire 230 feet high—the old and new town-houses, and the old castle. It has the greatest machine-making trade of the kingdom, has manufactures of a wine called Esslingen champagne, of woollens, and cotton and woollen yarns, lackered iron, silver-plate and tin wares, and paper, with a good trade in wine and agricultural produce. Pop. 14,777.

E. was founded in the 8th c., and received in 1209 the rights of a free city of the German empire. The long and bloody quarrel which existed between it and the House of Würtemberg was brought to an end at the peace of Lunéville (1802), when E., with its territory, was assigned to the duchy of Würtemberg.

ESSOUAN, or ESWAN. See ASSOUAN.

ESTABLISHED CHURCH, a church established and maintained by a state for the teaching of Christianity in a particular form within its boundaries. Subsequent to the Reformation, many of the opinions which had given sanctity to the Church of Rome still kept possession of men's minds; amongst these was the notion, that the civil government of each state was bound to maintain a particular form of Christianity. The same fallacious reasoning which in more recent times has led to the search for one absolutely best form of civil government was at work then with reference to the church. The Roman Catholic Church was not the best form—of that the Protestant states had become convinced—but all forms were not therefore indifferent; and if one was better than another, and another better than that, there must be an absolutely best, which the state was bound to discover, and when discovered, to substitute for that which had been abolished. The idea that the good or bad qualities of forms of government, whether civil or ecclesiastical, so long as they did not violate the fundamental doctrines of Christianity or morality, were relative, and not absolute, and that whilst one might be the best for men in one stage of development or of one particular temperament, another might be the best for those who differed from them in these respects, did not belong to that age. Each Protestant state consequently established a church, conformity to the tenets of which it enforced, not only upon those who as ministers were henceforth to enjoy the property which in Roman Catholic times had been devoted to the spiritual interests of the community, but very often on its own civil servants and advisers. The benefit of the arrangement was, that, to a greater or less extent, the means which the community had set apart for its own spiritual improvement were protected from the spoliation of private individuals; and this benefit was secured more effectually the more completely the new church took the place of the old—in England, for example, better than in Scotland; but as each of the Protestant states had substituted one form of church-government for another, and as the same form had not been adopted by them all, the idea of there being one form which was absolutely preferable to the others, though not abolished, was rudely shaken. In England, Queen Elizabeth had stated in her celebrated declaration, that she, as head of the church, 'would not endure any varying or departing in the least degree' from the doctrines of the Episcopal Church of England as set forth in the Thirty-nine Articles; and yet Presbyterianism was established in England in 1649. In Scotland, where Presbyterianism had at first taken root, Episcopalianism had more than once become the law of the land. The effect of such occurrences was to counteract the belief in any one form as the form for all Christendom, and to facilitate dissent and the formation of sects. The pastors of these sects were not at first recognised by the law as entitled to any of the privileges of Christian ministers. Whatever they might be to their own flock, to the state they were laymen, and their churches were mere secular lecture-rooms, or, at most, places of meeting for private devotion. See NONCONFORMITY, DISSENTERS, CHURCH, &c. Gradually this view became modified, and the civil consequences attaching to sacred rites, when performed by a clergyman of the establishment, were extended to them when performed by dissenters. See MARRIAGE. But though many of the privileges, and all the liberties belonging to the established church, have now been extended to dissenting bodies, including Roman Catholics (see ROMAN CATHOLIC EMANCIPATION) and Jews (see JEW), the established churches of the three divisions of the United Kingdom, are alone supported by the state, and are still guarded from spoliation by the Coronation Oath (q. v.) of the sovereign. With the exception of the grant to the Roman Catholic college of Maynooth, and the *Regium Donum* (q. v.) to the Presbyterian ministers in Ireland, there is no endowment of other sects from the public funds, as in France; and the emoluments of the established church, though modified in their distribution by the labours of the Ecclesiastical Commissioners (q. v.), have not yet been appropriated to any other than religious uses in connection with that church.

The cause of established churches is very generally maintained on the ground of the alleged duty of the state to provide for the religious instruction of the whole body of the people, as most essential to their moral welfare, and so to the general prosperity of the community. It is further argued, in support of the same cause, that civil rulers, or the people as associated in a free state, are under a moral obligation of the highest kind, to acknowledge God, his law, and his ordinances. Concerning which, and other arguments, for and against established churches, as far as it belongs to the scheme of this work to notice them, the reader is referred to the article VOLUNTARY CHURCHES. It may here, however, be observed, that the arguments just mentioned do not necessarily infer, even when admitted to the utmost, that the state is bound to support in any exclusive way a particular sect or denomination, unless, on the further assumption that religious truth and worth belong to that denomination alone. Nor does the *endowment* of a church by the state necessarily follow from the fullest adoption of the principles thus contended for. And, on the other hand, it is a point which may very reasonably be disputed, how far the common arguments against state endowments are applicable to those endowments which were not originally bestowed by the state, but which the state has, from a very early period, recognised as belonging to the church; a description which will be found to comprehend great part of the existing endowments of established churches. The exclusive possession of them by a particular denomination, and their rightful appropriation to religious uses, are, however, distinct questions.

ESTATE. In the law of England, an estate in lands, tenements, or hereditaments, signifies such interest as the tenant hath therein; so that if a man grants all his estate in Dale to A. and his heirs, everything that he can possibly grant shall pass thereby.—Blackstone, *Comm.* ii. 103. The first division of estates is into legal and equitable. By the former is signified the estate which a man has by the common law; by the latter, the interest which has been created by the operation of a court of equity. See EQUITABLE ESTATES, USES, TRUSTS. Legal estates are considered in England with reference to the quantity of the estate, the time of enjoyment, and the number of persons who may unite in the enjoyment. Under the first head, estates are either freehold or less than freehold. Freehold estates, again, are divided into freeholds of inheritance, or Fees (q. v.); and freeholds not of inheritance, or for life. An estate for life may be for the life of the person to whom it is granted, or for that of another person, or for more than one life. A person holding an estate for the life of another is called tenant *pur autre vie*. An estate *pur autre vie* being a freehold, descends, in case of the death of the tenant during the term, to his heir, and not to his executor. An estate by the Courtesy of England (q. v.), and an estate in Dower (q. v.), are estates for life. A conveyance to A. B., without mention of heirs, makes the grantee tenant for life. An estate to a woman during her widowhood, or to a man until the occurrence of a specified event, as till he receive a benefice, will be construed to be an estate for life. Tenants for life are entitled to take Estovers (q. v.), but they must not commit Waste (q. v.). The representatives of a tenant for life are also usually entitled to take the Emblements (q. v.) on the expiry of the term. Estates less than freehold are called also chattels real. This species of estate, on the death of the tenant, passes, like other Chattels (q. v.) to the executor, and not to the heir. They are divided into estates for years, estates at will, and estates on sufferance. See LEASES. Estates, with reference to the time of their enjoyment, may be either in possession or in expectancy. An estate in possession comprehends not only an estate in the actual occupation of the tenant, but one from which he has been wrongfully ousted. In this latter case, the law regards the rightful tenant as having the actual estate, to which is attached the Right of Entry (q. v.). An estate in expectancy may be either in REVERSION or REMAINDER (q. v.). Estates of this character form a large portion of the rights to land in England, and are the subject of some of the most subtle learning of the English law. With reference to the number of persons entitled to the enjoyment, estates may be in severalty, in joint-tenancy, in co-parcenary, or in common. An estate in severalty is where the sole right to the estate is in a single person. See JOINT-TENANCY, COPARCENARY, TENANTS IN COMMON.

ESTATE TAIL. See ENTAIL.

ESTATES OF THE REALM. The three estates of the realm are not King, Lords, and Commons, as is popularly believed, but the Lords Spiritual, the Lords Temporal, and the Commons. The ancient parliament of Scotland consisted of the king and the three estates of the realm, by which latter was meant—1st, the archbishops, bishops, abbots, and mitred priors; 2d, the barons, under which head were comprehended not only the nobility, but the commissioners of shires and stewartries; and 3d, the commissioners from the royal burghs. All these assembled in one house, and formed one meeting, by a majority of the votes of which all matters, whether legislative or judicial, were determined.—Ersk. b. i. tit. 3, s. 2. Bell's *Dictionary*. See STATES.

E'STÉ (ancient *Ateste*), a town of Venice, is beautifully situated on the southern slope of the Euganean Hills, 17 miles south-south-west of Padua. It is an old town, and has a decidedly Lombard appearance, many of the houses being supported by arches. It has several interesting buildings, among which the chief are the *Rocca*, or castle of Este, with a grim-looking donjon tower, overhanging the town, and the church of *San Martino*, in the Romanesque style, surmounted by a campanile, which slopes as much as the Leaning Tower of Pisa. Both church and tower have been sadly disfigured by an attempt to modernise them. E. manufactures silk goods, saltpetre, hats, and earthenware and has numerous silk-mills and whetstone quarries in the vicinity. Pop. 8000.

E'STÉ, one of the oldest and most illustrious families of Italy, which, according to the historian Muratori, owed its origin to those petty princes who governed Tuscany in the times of the Carlovingians, and who were in all probability of the race of the Longobards. The first whose figure is more than a mere shadow is Adalbert, who died about 917 A. D. The grandson or grand-nephew of Adalbert, named Oberto, was one of the Italian nobles who offered the crown of Italy to Otho of Saxony. He is afterwards styled *Comes sacri palatii*, and appears to have been one of the greatest personages in the realm; he married a daughter of Otho's, and died about 972 A. D. In later times, the family of E. received from the emperors several districts and counties, to be held as fiefs of the empire. The family divided, at an early period, into two branches, the German and Italian. The former was founded by Welf or Guelfo IV., who received the investiture of the duchy of Bavaria from the Emperor Henry IV. in 1070. The Houses of Brunswick and Hanover, and consequently the sovereigns of Great Britain, also called Este-Guelfs, are descended from this person. In the 12th, 13th, and 14th centuries, the history of the E. family, as heads of the Guelf party, is interwoven with the destinies of the other ruling families and small republics of Northern Italy. During this period, they first gained possession of Ferrara and the march of Ancona (1208 A. D.), and afterwards of Modena and Reggio (1288—1289), and were widely celebrated as the patrons of art and literature. One of the most illustrious was Azzo VII., who encouraged Provençal troubadours to settle at his court at Ferrara, and also founded schools in that city. Alfonso I. (died 1534) was equally distinguished as a soldier and a statesman, and was celebrated by all the poets of his time, particularly by Ariosto. His second wife was the notorious Lucrezia Borgia. His quarrel with the Popes Julius II., Leo X., and Clement VII., was unfortunate, as an interdict was laid upon him for his adherence to the league of Cambray, and his papal fiefs declared to be forfeited. After the siege of Rome, in 1527, the duke was restored to his former possessions by Charles V. His successor, Ercole or Hercules II., who married Renate, daughter of Louis XII. of France and Anne of Brittany, attached himself to Charles V. He and his brother, a dignitary of the Catholic Church, were also liberal patrons of art and science; the latter erected the magnificent Villa d'Este at Tivoli. The next prince, Alfonso II. (died 1597), would have been noways inferior to the preceding but for his immoderate love of splendour, his inordinate ambition, and the cruelty he displayed towards the poet Tasso, whose eccentricities, however, it must be confessed, were enough to try the patience of any reasonable mortal. Alfonso IV., who flourished in the latter half of the 17th c., was very fond of the fine arts, and founded the Este gallery of paintings. *Rinaldo* (died 1737), by his marriage with the daughter of the Duke of Brunswick-Lunenburg, united the German and Italian Houses, separated since 1070. The male line of the House of E. became extinct on the death of Ercole III. in 1803, his possessions having been previously seized by the French invaders, and annexed to the Cisalpine Republic. His only daughter married the Archduke Ferdinand, third son of Francis, emperor of Austria. Their eldest son, Francis IV., by the treaty of 1814—1815, was restored to the territories which had belonged to his maternal ancestors, comprising the duchy of Modena; and, on his mother's death, obtained the duchies of Massa and Carrara. He was succeeded by his son, Francis V., 21st January 1846. The connection which the family of E., like others of the small Italian principalities, had formed with Austria, gave it, of course, pro-Austrian sympathies, the result of which has been fatal to its popularity and dynastic existence. In 1860, the sentiment of Italian unity and independence, which for the previous 15 or 20 years had been steadily fostered by the policy of Sardinia, triumphed in a universal explosion of national feeling, which swept Italy clean of all her petty rulers, and united the peninsula (with the exception of Rome and Venice) under the single authority of Victor Emmanuel, formerly king of Sardinia, now king of Italy.

ESTE'LLA, an ancient city of Spain, in the province of Navarre, is pleasantly situated on the left bank of the Ega, about 27 miles south-west of Pamplona. It is a well-built, clean town, with several squares, and has, in the environs, a variety of agreeable promenades and pleasure-grounds. It has two interesting churches, both old, and one of them, San Juan, a fine building with a very lofty tower.

The manufactures are woollen and linen fabrics, brandy, and earthenware. A tolerable wine is made in the vicinity. E. has some trade in fruits, wool, hardware, and grain. Pop. about 6000. Here Don Carlos was proclaimed king in November 1833; and here, in February 1839, six of his officers were treacherously betrayed and executed without even a form of trial.

ESTE'PA, a town of Spain, in the province of Seville, and 60 miles east-south-east of the town of that name. It is, on the whole, well built; has four squares, and numerous religious edifices, among which are the churches of Santa Maria and San Sebastian; the former, a noble specimen of Gothic, having three naves, and a richly ornamented interior. It has manufactures of coarse cloth, baize, and oil, with a trade in grain, fruits, oil, brandy, wool, and cattle. In the vicinity are marble and building-stone quarries. Pop. 7339.

ESTEPO'NA, a maritime town of Spain, in the province of Malaga, and 25 miles north-north-east of Gibraltar. It is well and regularly built; its streets wide, clean, and well paved. It supplies Gibraltar with fruits and vegetables; and its chief industrial features are its fishing, linen-weaving, and manufactures of leather. Pop. 9400.

E'STERHAZY, an ancient Hungarian family, afterwards raised to the rank of princes of the empire, the representative of which is at present the richest landed proprietor in Austria. The family divided into three main branches—the Esesznek, Altsohl or Zolyom, and Forchtenstein lines. A descendant of the last family, Nicholas de Esterhazy, born in 1765, travelled over a great part of Europe, and resided for a considerable time in England, France, and Italy. He founded the splendid collection of pictures at Vienna. He also made a choice collection of drawings and engravings. When Napoleon, in 1809, entertained the notion of weakening Austria by the separation of Hungary, he made overtures to Prince Esterhazy respecting the crown of Hungary, which, however, were declined. The great Haydn composed most of his works at the court of Prince Nicholas. His son, Prince Paul Anton d'Esterhazy, born in 1786, entered at an early age on a diplomatic career. After the peace of Vienna, he went as ambassador to the court of Westphalia. From 1815 to 1818, he represented the Austrian government at London. He filled the same office between 1830 and 1838, and distinguished himself by his diplomatic tact and ability. In 1842, he returned home, and continued to exert himself in the cause of political and literary progress. In March 1848, he became Minister of Foreign Affairs, in the cabinet presided over by Batthyani; but when the struggle between Austria and Hungary broke out, he exhibited more prudence than heroism by retiring from public affairs altogether. The hereditary prince, Nicholas Paul Charles Esterhazy, born 25th June 1817, married Lady Sarah Villiers, daughter of the Earl of Jersey.

E'STHER (the word signifies 'the planet Venus') is the Persian name of Hadassah, daughter of Abihail, the son of Shimei, the son of Kish, a Benjamite. She is represented in Scripture as an orphan, and as having been brought up by her cousin Mordecai, an officer in the household of the Persian monarch Ahasuerus. Her history, as recorded in the book of Esther, is well known and extremely interesting. When the misconduct of Vashti had cost her her 'royal estate,' all 'the fair young virgins' of the kingdom were gathered together, that Ahasuerus might choose a successor. He selected Hadassah, who received the name of E. on account of her loveliness. The great event of her life was the saving of her Jewish countrymen from the horrors of that universal massacre planned by the malice of Haman, and consented to by the thoughtless cruelty of an Oriental despot. The details of this event are too familiar to require narration. It is sufficient to say that E.'s success was signal; and the feast which she and her cousin Mordecai appointed in memory of their deliverance—viz., the feast of Purim (i. e., of Lots), is, in consequence, celebrated with great enthusiasm. E. is not mentioned in profane history, whence it has been inferred by some that she was not exactly the *wife* of Ahasuerus (Xerxes), but rather the favourite of his harem, to which she undoubtedly belonged; for, as we read (ii. 8), E. was consigned 'to the custody of Hegai, keeper of the women.' This hypothesis is rendered probable by the fact, that the Persian kings did not choose wives from their harem, but from the principal Persian families, or else from the daughters of foreign potentates.

ESTHER, Book of, one of the very latest of the canonical works of the Old Testament, and commonly, but without a shadow of evidence, supposed to be written by Mordecai or Ezra. This is the view of Ahenesra, Clement of Alexandria, Augustine, Gerhard, and others. The Talmud assigns the authorship to the members of the Great Synagogue, a semi-mythical body, who are made use of by Jewish rabbis and Christian divines as a sort of *Deus ex machina* to solve every difficulty. According to the opinions of the most learned and unprejudiced critics, the date of its composition must be placed after the downfall of the Persian monarchy. The language is much later than that of Ezra and Nehemiah, and the fact of occasional explanation of Persian customs fits the period of the Seleucidæ better than an earlier one. The Hebrew text is that which has been followed in the English version; but the Septuagint is full of late interpolations and additions by Alexandrian Jews. The book is held in the highest reverence by the Jews; so much so, that Maimonides declared that, in the days of the Messiah, every Jewish scripture would be forgotten except the book of Esther and the Pentateuch. The book is not written in a theocratic spirit, like the rest of Jewish literature. Nothing is directly attributed to God; in fact, his name is not once mentioned. Neither is there the remotest trace of religious feeling of any kind. Luther, in his usual off-hand hasty way, expressed his contempt for the book, in spite of the admiration which the Jews bestowed on it, censuring it for its 'heathenish extravagance,' and declaring that, in his judgment, it was 'more worthy than all of being excluded from the canon.' The absence of all recognition of God, perplexed some of the ancient Jewish commentators, who therefore invented the hypothesis, that the book was originally a part of the Persian chronicles, probably executed by Mordecai; and that, being intended for the heathen, the sacred name was wisely left out!

ESTHO'NIA, called by the inhabitants themselves *Wiroma* (i. e., the Border-land), a Russian government, and one of the Baltic Provinces (q. v.), extends immediately south of the Gulf of Finland; has an area of 7597 square miles, and a population of about 300,000. It was conquered (1182—1241) by the Danes, who sold it to the Teutonic knights in 1346. It came into the possession of the Swedes in 1561, but was taken from them by Peter the Great in 1710; and by the treaty of Nystadt was finally secured to Russia in 1721. One-third of the entire surface, which is in general flat, is under cultivation, and produces great quantities of rye and barley; the remaining two-thirds are chiefly composed of sandy tracts and marshes, strewn in many places with large blocks of granite; there are also extensive forests of birch and pine. The government of E. is divided into four circles; its principal town is Reval or Revel (q. v.).

The inhabitants are divided into Esthlanders and Esths. The former are a mixture of Swedes, Germans, and Russians, and comprise the nobles and the town-populations. The latter belong to the Finnish race, and are the original possessors of the soil. Their language is soft and musical, and is divided into two leading dialects, that of Revel and that of Dorpart. They also possess a literature rich in splendid national songs. See Neus, *Esthnische Volkslieder* (Reval, 1850—1851). They are industrious, kind-hearted, and in the main religious and attached to the Protestant doctrines. A great part of Livonia is peopled with Esths, the entire number of whom in the Baltic provinces is about 650,000.

ESTO'C (Italian), a small dagger worn at the girdle, called in Elizabethan times a Tucke (q. v.).

ESTOILE, or **STAR**, in Heraldry, differs from the Mullet (q. v.) by having six waved points; the mullet consisting of five plain points.

ESTO'PPEL, an impediment or bar to a right of action, arising from a man's own act. It is called an estoppel or conclusion, because a man's own act or acceptance stoppeth or closeth up his mouth to allege or plead the truth.—*Co. Litt.* 352 a. Estoppels are of three kinds—1. By matter of record, where any judgment has been given in a court of record, the parties to the suit are estopped from afterwards alleging such matters as would be contradictory to the record. 2. By matter in writing. Thus, a party who has executed a deed will be precluded from afterwards denying, in any action brought upon that instrument, the fact of which it is evidence. 3. By matter in *pays*, as by livery, by entry, by acceptance of rent, &c.—by any of which acts a man is barred from pleading anything to the contrary. The principle of estoppel is that what a man has once solemnly alleged is to be presumed to be true, and therefore he should not be suffered to contradict. The doctrine of estoppel prevails in America as well as in England. In Scotland also, the same principle is recognised, under the name of Personal Exception (q. v.).

ESTO'VER (Fr. *estoffer*, to furnish), an incident to the estate of a tenant for life or for years. It is the right which the tenant has to make use of the wood on the estate for certain definite purposes. Estovers, or *botes* (Saxon), are of three kinds—house-bote, which is twofold—viz., *estoverium ædificandi et ardendi*, a right to wood for fuel and repairs of the house, ploughbote, *estoverium arandi*, wood for ploughs and carts; and haybote, *estoverium claudendi*, wood for repairing hedges and fences.—*Co. Litt.* 41 b.

ESTREA'T (Lat. *extractum*), in English Law, a true extract copy or note of some original writing or record, and specially of fines or amercements, as entered in the rolls of a court, to be levied by bailiffs or other officers. When, however, it is applied to a Recognisance (q. v.), it signifies that the recognisance itself is estreated, or taken out from among the other records, and sent to the Exchequer.—Blackstone, *Comm.* iv. 253. If the condition of a recognisance be broken, the recognisance is forfeited; and on its being estreated, the parties become debtors to the crown for the sums in which they are bound.—Archbold, *Crim. Practice*, 78. The Court of Exchequer has power over penalties and forfeitures incurred at assizes, and can discharge or compound them at its discretion; but that court has no power over recognisances forfeited before justices of the peace.

ESTRÉMADU'RA, previous to the new distribution of the country, a province of Spain, situated between Portugal and New Castile, and watered by the Tagus and the Guadiana. It is bounded on the N. by Leon, on the S. by Andalusia, and, since 1833, has been divided into the two provinces of Badajos and Caceres. It has an area of 16,554 square miles, and contains about 707,115 inhabitants. Although a continuation of the high table-land of New Castile, E. is not, like it, a uniform plain, but is mountainous on the north and south, and is well watered, the slopes of the hills being covered with wood, and the valleys with rich grass. Notwithstanding the fertility of the soil, the land has lain desolate and uncultivated ever since the expulsion of the Moors in the 13th century. This is chiefly to be attributed to the Mesta, or right of pasture, which causes the land to be regarded as the common property of the possessors of flocks. The breeding of goats, swine, horses, asses, and mules is much attended to. Silk and honey form no inconsiderable branches of trade. Corn is still imported. The mines, which were formerly very productive, are no longer wrought. Commerce is confined almost entirely to a contraband trade with Portugal. The inhabitants are poor, and, from the want of roads, isolated from the rest of Spain, and consequently in a low state of civilisation. They make excellent soldiers, however, and have produced a series of brave *conquistadores* and generals.

ESTRÉMADURA, next to Alemtejo, the largest province of Portugal, has an area of 8180 square miles, and, including the capital, Lisbon, contains 751,571 inhabitants. The greater part of the country is hilly, but the hills do not attain any great elevation. To the west of the estuary of the Tagus are the granite mountains of the Serra da Cintra, varying from 1500 to 1800 feet in height, and terminating in the Cabo de Roca. To the south of the Tagus are barren moors, partly broken by morasses, and the limestone chain of Arrabida, rising to a height of 1000 feet, and terminating in the Cabo de Espichel. Many districts are extremely fertile, others are barren and uncultivated. The Tagus, which is only navigable as far as Abrantes, receives the waters of the Zezeres, the Sorraya, and the Canha, and is strewn with islands at its mouth. The chief productions of the country are wine, oil, fruits, corn, and cork; but even the sandy plains are covered with cistus, rosemary, myrtles, and other flowering and fragrant plants. The breeding of cattle is not much attended to. The minerals are marble, coal, and sea-salt. This province has been frequently visited by earthquakes.

ESTREMO'Z, a fortified town of Portugal in the province of Alemtejo, is 23 miles north-east of Evora, and about the same distance east of Elvas. It is built round the base of the hill on which its once formidable castle, erected in 1360, is placed. It now ranks as the fourth or fifth stronghold in Portugal. E. is famous for its manufactures of earthenware; its jars, which are made of a porous clay, and have the property of keeping water singularly cool, are of elegant shape, and are used all over the peninsula. The earthenware manufactures of E. seem to have continued unchanged since Roman times, as until the present day the forms into which the jars are cast are purely classical. In the neighbourhood of E. is a marble quarry. Pop. 6500.

E'SZEK, a royal free town of Slavonia, on the right bank of the Drave, twelve miles above its confluence with the Danube, is the chief town of the district of Veroecze, and is the most prosperous trading-town of Slavonia. Since the Drave began to be navigated downwards to E. by steamers, the town has driven a prosperous trade in corn, wood, pigs, iron, deals, wine, and flax. The fortress of Eszek, known in Roman times under the name of Mursia, is protected by a fort situated on the left bank of the Drave. In the fortress, the commander's dwelling and the town-house, and in the lower town the county buildings, are specially worthy of mention. During the Hungarian revolution, the town was at first held by Count Casimir Batthyânyi, but capitulated, after a siege of several weeks, to the Austrian general, Baron Trebersberg. Pop. 13,138, more than one half of whom are Roman Catholics, the rest being Greek Catholics, Protestants, and Jews.

ETAMPES (anc. *Stampæ*), a town of France, in the department of Seine-et-Oise, is situated 32 miles south-south-west of Paris, on the Orleans Railway. It consists mainly of one street, about four miles long. The chief buildings are the ecclesiastical edifices. E. possesses a public granary, capable of containing 1400 tons of wheat. In and around E. there are upwards of 40 flour-mills, constantly employed in providing for the Paris market; considerable quantities of garden-stuff also are sent from this neighbourhood to the capital. Pop. 8000.

ETANG DE BERRE, a salt-lake of France, in the south of the department of Bouches-du-Rhone, communicates with the sea by a narrow channel, called Tour-le-Bouc, and is 11 miles long by 9 broad at its widest part. This lake contains great quantities of eels and other fish. Salt-works are in operation on its banks.

ETAWAH, a town of the Doab, stands near the left bank of the Jumna, about 70 miles below Agra, in lat. 26° 46′ N., and long. 79° 4′ E. Though it is, on the whole, a dreary and mean place, yet it presents some remains of ancient grandeur, more particularly many of those ghats or flights of stairs which facilitate the approach to the river for the purpose of ritual ablution. It contains about 18,000 inhabitants; and its prosperity, such as it is, is owing chiefly to its position at the junction of the two roads which lead to Agra from Cawnpore and Calpee.

ETA′WAH, the district of which the town above mentioned is the capital, belongs to the sub-presidency of the North-west Provinces. It lies entirely in the basin of the Jumna, and almost exclusively within the Doab, stretching in N. lat. from 26° 21′ to 27° 9′, and in E. long. from 78° 46′ to 79° 49′, and containing 1674 square miles, and about 500,000 inhabitants. The district was at one time famous for the murderous fanaticism of the Thugs, 67 corpses of their strangled victims having been found in the wells during a single year.

ETCHING. See Engraving.

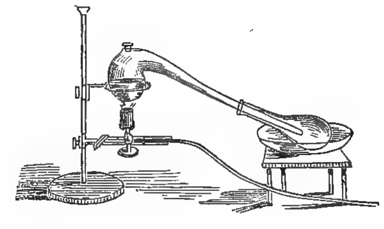
ETCHING UPON GLASS. See Glass.

E′THELBERT, king of Kent, and fourth in direct descent from the great Hengist, was born in the year 552, and succeeded to the throne in about the eighth year of his age. The representative of the first Saxon king who ruled in England, and envious on that account of the title of Bretwalda, then enjoyed by Cealwin of Wessex, E. rashly undertook an expedition against that king in 568, a venture which, had he known the extent of country covered by the West Saxons, he would probably never have made. The rival kings met at Wibbandune, now Wimbledon, in Surrey, where a great battle took place, resulting in the defeat of Ethelbert. This is recorded as being the first battle that ever occurred between Anglo-Saxon sovereigns. Taught by disaster and danger, E. became more prudent. His subsequent schemes were more successful, and, about the year 590, he was acknowledged as Bretwalda of the Saxon octarchy, a dignity which he maintained to the close of his reign and life. In 570, E. married Bertha, a Frankish princess. The lady was a Christian, and it is said had stipulated, as a condition of her marriage, that she should be allowed, after her arrival in Kent, to practise her own religion. Her amiable piety had completely disarmed E. of all violence against the Christian religion long before the most important event of his life took place, viz., the formal introduction of Christianity into his kingdom. This was effected by means of the ministrations of St Augustine, who was sent to Britain by Pope Gregory, and who landed in Kent in 596. In the following year the king himself was converted, and Christianity established among the hitherto pagan Saxons. After his conversion and baptism, he founded the bishopric of Rochester, and, in concert with his nephew Sebert, king of Essex—who also had been converted—erected the church of St Paul's in London. He died in 616.

E. is also distinguished as the author of the first written Saxon laws. These are the *Dooms*, as they are called by Bede, 'which he established with the consent of his Witan in the days of St Augustine.' They are in the Saxon language, and are the earliest written laws that exist in any modern tongue.

ETHELRE′DA, St, a daughter of the king of the East Angles, in the 7th c. canonised for her saintly virtues, and whose festival in the calendar is October 17. Her name was popularly abbreviated or corrupted into St Audrey. At a fair in the Isle of Ely, called after her St Audrey's Fair, it was customary to sell a common kind of lace, which came to be known as St Audrey's lace. *Tawdry*, as applied to any inferior kind of frippery, is believed to be a corrupt use of the term St Audrey.

E′THER (otherwise called Ethylic Ether, Vinic Ether, and Sulphuric Ether) is prepared from alcohol by the action of sulphuric acid at an elevated temperature. On the small scale, the apparatus which may be employed for the purpose is the retort and receiver, into which a mixture of equal weights of spirits of wine, or rectified spirit and oil of vitriol, or, by volume, 2 of alcohol and 1 of sulphuric acid, are placed, and heat being cautiously applied, a liquid distils over, which consists of ether and water. In a short time, the contents of the retort begin to blacken, and the operation must be stopped, or the distillate will become contaminated with sulphurous acid. On the large scale, a modification of the process is carried on, which renders it theoretically a 'continuous process,' though, practically, there is a limit to the amount of ether distilled over.



The conversion of alcohol (C_4H_5O,HO) into ether (C_4H_5O) and water (HO) by oil of vitriol ($HOSO_3$), was at one time considered to be due simply to the strong affinity of the oil of vitriol for water, which enabled it to take possession of the one atom of water, the elements of which form the only difference in the ultimate composition of alcohol and ether. This simple mode of explaining the process of etherification, however, does not acknowledge that the atom of water is not retained by the oil of vitriol, but is given off side by side with the ether in mechanical solution therewith. The theory of the process now generally accepted is too complex for introduction here.

Ether is a colourless, transparent, volatile liquid of great mobility and high refractive power, and possessing a fragrant odour, and a fiery, passing to a cooling, taste. When pure, it has the specific gravity 720 (water = 1000) at 60° F., though the commercial specimens are never free from water and alcohol, and have the density 740. It boils at 94·8° F. (the commercial at 96°), and yields a very dense vapour, the specific gravity of which is 2586, as compared with air 1000. When reduced to a temperature of — 24° F., ether freezes. It volatilises spontaneously when placed in an unconfined position, as in the palm of the hand, and vaporises so quickly as to produce intense cold. Indeed, when water is covered with ether, and the latter assisted in its evaporation by being blown upon, it escapes so readily as to reduce the temperature of the water to 32° F., when it freezes. It is very inflammable, burning with a yellow-white flame; and mixed with air or oxygen, it gives rise to a dangerous explosive mixture, and hence great care requires to be taken in its distillation to keep all lights and fires out of the room where the vapours are condensing. When ether is added to its own bulk of water, briskly agitated, and allowed to settle, the two liquids appear to separate again; but it is found that the ether has taken up one-eighth of its volume of the water, whilst the latter has dissolved the same quantity of ether. It is readily miscible with alcohol in all proportions. Ether is one of the best solvents for the oils and fats, and hence is employed in analysis for the solution and separation of the oils from other organic matters, as in the analysis of oil-cakes, &c. It is also a good solvent of iodine, sulphur, phosphorus, and of strychnine, and other alkaloids, as well as of corrosive sublimate, and other salts.

Ether is useful in the preparation of freezing mixtures, and the mixture of ether and solid carbonic acid gives rise to the lowest temperature which has as yet been attained. When inhaled by man and the lower animals, ether first produces stimulating and intoxicating effects, but afterwards it gives rise to drowsiness, accompanied by complete insensibility, which entitles ether to be regarded as an important anæsthetic agent; and, indeed, for some time it was the only agent used for producing Anæsthesia (q. v.) in operations, but has been entirely superseded by the employment of chloroform.

Ether enters into combination with many acids, forming compound ethers, possessing great fragrancy, the more important of which are given in the following table:

Acetic Ether, .	$C_4H_5O,C_4H_3O_3$.	
Butyric Ether, .	C_4H_5O,C_8H_7O,	Pine-apple Oil.
Caproic Ether, .	$C_4H_5O,C_{12}H_{11}O_3$	Essence of Melons.
Rutic Ether, .	$C_4H_5O,C_{20}H_{19}O_3$	
Pelargonic Ether,	$C_4H_5O,C_{18}H_{17}O_3$,	Essence of Quinces.
Œnanthic Ether,	$C_4H_5O,C_{14}H_{13}O_2$,	Wine Oil.

There are other ethers, in which ordinary ether is not one of the members, as

Amyl Acetic Ether, .	$C_{10}H_{11}O,C_4H_3O_3$,	Jargonelle Pear Oil.
Amyl Valerianic Ether,	$C_{10}H_{11}O,C_{10}H_9O_3$,	Apple Oil.
Methyl Salicylic Ether,	$C_2H_3O,C_{14}H_5O_5$,	Oil of Winter Greens.

ETHER, sometimes **ÆTHER**, the name given to the medium which is assumed in astronomy and physics as filling all space. It was shewn by Newton, that if light consisted of material particles projected from luminous bodies, these must move *faster* in solids and liquids than in air, in order that the laws of refraction might be satisfied in their motions. Huyghens, on the other hand, shewed, that to account for the same laws on the supposition that light consisted in the undulatory motions of an elastic medium, it must move more *slowly* in solids and fluids than in gases. Fizeau and Foucault have lately, by different methods, measured these velocities relatively, and have found Huyghens's prediction to be correct. Light, then, consists in the vibratory motion of a medium, which must, of course, fill all space. This is called Ether. As yet, we have no idea as to its ultimate nature; some of our greatest philosophers, even, have supposed that it may be of the class of ordinary gases, and that our atmosphere, for instance, is not finite in extent, but pervades, with greatly reduced density, all interplanetary and interstellar space. Many objections, however, may easily be raised against this supposition. Meanwhile, we may remark that the mathematical theory of light, on the hypothesis of undulations, requires that the vibrating medium should possess properties more nearly allied to those of an elastic *solid* than those of a liquid or a gas. The ether being *required* for the explanation of the existence and the propagation of light, it becomes a matter of importance to inquire how many more of the physical forces may be referred to the same cause or medium. Radiant heat most certainly may, and, in all probability, gravitation, molecular actions, magnetic, electric, and electro-dynamic attractions and repulsions, are also to be thus explained. As to sensible and latent heat, electricity and magnetism themselves, the necessity is not so clear; but even these have been of late *almost* satisfactorily explained by the hypothesis of the all-pervading ether. See FORCE. In the article just referred to, a good deal more will be found with reference to this subject, and especially with reference to the impossibility of the ether's consisting of air or other gases, which are made up of distinct and separated particles.

E'THICS, a word of Greek origin, meaning nearly the same thing as the more familiar term Morals. The science, treating of the nature and grounds of Moral Obligation, and expounding our various duties, is called sometimes by the one term, and sometimes by the other. This is a subject wherein opinions so different from each other have been, and are still held, that a writer's task must lie first in explaining what are the chief points in dispute, and next in giving an account of the positions taken up by the opposing schools.

There are two distinct questions connected with the Theory of Morals. The first is the properly ethical question, and is, what is *the criterion of a moral act?* otherwise expressed as the *moral standard*—the circumstance determining an action to be *right*, and not *wrong*, nor simply indifferent as regards right and wrong. What determines us to single out some conduct as the subject of *moral approbation*, and other conduct as the subject of *moral disapprobation?* We consider murder, theft, breach of promises or contracts, resistance to authority, cruelty, ingratitude, slander, holding of slaves, polygamy, to be wrong, or immoral; and the science of ethics is called upon to assign the reason, or reasons, why these various actions are so accounted.

The other question is properly psychological; in other words, relates to the constitution of the human mind. It is, by what *faculty of our nature* do we recognise this difference in actions? Is it by one of our ordinary intellectual faculties, such as Reason? or by some of our emotional susceptibilities, as Love and Hatred? or by a mixed faculty like Prudence? or by something peculiar and distinct, relating to this one object and no other, as the eye is formed for recognising colour, and the ear for sound? This question has been often improperly mixed up with the other, although there are certain theories wherein the answer to the first depends on the answer to the second.

As regards the Standard of Morals, it should be premised that Punishment for neglect is what shews an action to be obligatory. We may dislike a man's conduct; but if we do not consider it deserving of punishment, it is not immoral in our eyes. People's imprudences, whereby they hurt themselves alone, are disapproved of; but there is seldom any disposition to step in by way of penalty in order to prevent such conduct; the disapprobation, therefore, is not of the moral kind. The punishment inflicted by society is partly legal, or through the civil government, and partly by public opinion, which, by attaching a stigma to certain conduct, is able to inspire no less dread than the civil authority. The punishment, by society acting in this way, is sometimes called the popular sanction, to distinguish it from the legal sanction. *Dishonour* is another name for the same thing. Many kinds of conduct tolerated by law, are still punished by the loss of public esteem and the infliction of disgrace. Cowardice, eccentricity, heterodoxy beyond certain limits, expose the individual to public censure. Many kinds of inhumanity, as maltreating dependents, have no other check than expressed disapprobation.

There have been various theories to account for the singling out of some actions to be authoritatively forbidden by Law and Society—that is, forbidden by the sanction of punishment. Some have said that the will of the Deity, or divine revelation, has indicated what we are not to do, and that there is nothing left to us but to conform to what is thus prescribed; others, as Cudworth, maintain, on the contrary, that what the Deity commands must be such as our own conscience approves, otherwise we could not give Him the character of being independently good and just. It has been said that Right Reason shews us the difference between right and wrong; this was Cudworth's own view. Samuel Clarke conceived that there was an eternal and intrinsic *fitness* in the things considered as right, and an unfitness in the wrong, 'with a regard to which the will of God always chooses, and which ought likewise to determine the wills of all subordinate rational beings.' Both these writers aimed at replying to Hobbes, who had maintained that the Civil Magistrate is supreme in Morality as well as in Politics; meaning, however, in all probability, that the magistrate himself ought to frame his dictates in one, as in the other, with a view to the public good, which would be a Utilitarian view. The phrase, 'the Moral Sense,' which now represents perhaps the most prevalent moral theory, occurs first in Lord Shaftesbury's *Inquiry Concerning Virtue*, from whom it was adopted by Hutcheson, and has since passed into general currency. Sometimes it has been maintained that a regard to Self-interest is the only ultimate rule of right, which has a very different meaning, according as we look at self exclusive, or inclusive, of other men's wellbeing. The most enlarged benevolence, in one view, is but an aspect of self. Adam Smith, in his *Theory of Moral Sentiments*, laid down as the criterion of right, the 'sympathetic feelings of the impartial and well-informed spectator.' But although this theory acknowledges our bias in the capacity of agents, it presumes us to be infallible when acting as judges or critics, a position by no means self-evident. The spectator has his own failings as well as the actor, unless specially qualified by nature and education to play the part of a moral judge. But to pass on. Jeremy Bentham is known as the most distinguished propounder of the principle of Utility as the basis of morals, a principle explained by him as in contrast, first to Asceticism, and next to 'Sympathy and Antipathy,' by which he meant to describe all those systems, such as the Moral Sense theory, that are grounded in internal feeling, instead of a regard to outward consequences. In opposing Utility to Asceticism, he intended to imply that there was no merit attaching to self-denial as such, and that the infliction of pain, or the surrender of pleasure, could only be justified by being the means of procuring a greater amount of happiness than was lost. Paley also repudiated the doctrine of a Moral Sense, and held that virtue is 'the doing good to mankind, in obedience to the will of God, and for the sake of everlasting happiness.' The utilitarian theory of Bentham, with various modifications, has been defended and expounded by James Mill, in his *Analysis of the Human Mind*, and in his anonymous *Fragment on Mackintosh;* by John Austin, in his *Province of Jurisprudence Determined;* and by Mr John Stuart Mill in his *Dissertations and Discussions*, and in *Fraser's Magazine* (Oct. to Dec. 1861).

The great controversy may be said to lie between the adherents of the Moral Sense in some form or other, and those that deny both the existence of a separate faculty in the mind for perceiving moral distinctions, and the validity of the determinations of the individual conscience; maintaining that morality ought to be founded on a regard to the wellbeing of mankind, and that exclusively; and that rules of morality grounded on any other motives are indefensible. In short, the question is, Is morality an intuition of the mind, or is it like the government of the state, a positive institution, on which different societies may differ, and which may be set up or be abrogated at the pleasure of the society?

The theory of Intuitive Morality was vigorously assailed by Locke in his *Essay on the Understanding* (book i. chap. 3); and we may venture to say that his objections to what he called 'Innate Practical Principles' have never been answered. These objections have been given in a condensed form by Paley (*Moral Philosophy*, book i.). Locke urged that, in point of fact, there are no principles universally received among men; that moral rules require a reason to be given for them, which ought not to be necessary, if they are innate; that virtue is generally approved of, not because innate, but because profitable; that innumerable enormities have been practised in various countries without even causing remorse; that the moral rules of some nations are flatly contradicted by others; that no one has ever been able to tell what the innate rules are; that we do not find children possessed of any moral rules, &c. It has been attempted to reply to the objection, founded on the great variety and opposition of moral rules in different places and times, by saying that although the substance of the moral codes differ—one part of the world being monogamous and chaste, while other nations allow promiscuous intercourse of the sexes—all agree in enjoining some moral rules; nowhere is there an absence of social and moral obligations. But this is to depart from the original question, which was to assign the standard of morals, the criterion for determining which of two opposite courses—monogamy or polygamy—is the correct or moral course. The intuitive moralists say that human nature is endowed with an instinct which at once approves the right and disapproves of the wrong, and that we need go no further than our own conscience to settle the point. Now, when the existence of contradictory consciences is pointed out, it is not to the purpose to say that these are still consciences, and indicate something as obligatory; this all admit: what we desire is, to determine which we are to follow.

Dr Whewell, in his *Elements of Morality*, has proposed a way out of this serious difficulty by setting up a supreme or Standard Conscience, by which the individual conscience may be squared and corrected; but he has not told us who are the men whose conscience is the standard; it being obvious that the human race, as a whole, do not recognise any such, although each separate community might consent to take some of its most estimable citizens, or the interpreters of its religious code, as models to conform to.

The following is one view of the nature and origin of our moral principles which would seem free from the grave objections above alluded to. If we set aside for the present the question as to the *proper* standard of morals, the criterion that we should consider the right criterion, if we had to enact a code of morals for the first time, and if we look at the moral principles that have prevailed in different nations and times, we shall find that they have been dictated from two distinct kinds of motives. The one is Utility, in the sense of the common safety of men living in society. The prohibitions against manslaying, theft, breach of bargain, rebellion, are necessary, wherever men have formed themselves into communities; and it is the agreement in such matters as these—although subject still to very great varieties—that makes up the amount of uniformity actually observed in the moral codes of nations. If the society did not agree to protect life and property, by punishing the murderer and the thief, nothing would be gained by coming under the sway of Government, and human beings would not be got to associate themselves in tribes or nations. The common end gives a common character to the means, without supposing a special instinct to suggest that stealing is wrong. But, in the second place, there have been, in the moral codes of all countries, prohibitions not connected with any public utility, but prompted by strong sentimental likings or aversions, which have acquired the force of law, and are made the foundation of compulsory enactments. Of this kind is the antipathy of the Jew and the Mohammedan to the pig, the Hindu repugnance to animal food generally, and the usages of a merely ceremonial kind prevailing among many nations, which are as stringently enforced by law and public opinion as the sacredness of life and property. For a woman, among the Mussulmans, to expose her face in public, is as great an offence as going naked would be with us; while, among savage tribes, in warm climates, where clothing is little required, it is no shame to expose the whole person. For these practices, no reason can be given; the public sentiment has determined some things to be right and others wrong, without reference to any public or private utility; and it is in these enactments, founded on liking or disliking, that nations have differed most widely, the difference often amounting to contrariety. The ancient Greeks held it as a sacred obligation to drink wine in honour of Dionysus (Bacchus); the Nazarenes among the Jews and the Mohammedans entertained an opposite view. A legislator for the North American Indians might prohibit alcoholic liquors on the ground of public utility, the natives not being able to control themselves under stimulants; but the prohibition of wine in those other instances is probably a species of asceticism, or an aversion to human pleasures as such, which belongs to the domain of sentiment, and not to the consideration of utility.

Looking at the many capricious injunctions that owe their origin to fancies such as these, it may be doubted whether the human race can ever gain anything by departing from the principle of utility as the sole criterion of good morality; and there is an increasing tendency to recognise the supremacy of this principle both in Morals and in Legislation. Justice, truth, purity, although sometimes viewed sentimentally, or as being ends themselves, are in men's practice looked upon more and more as of the nature of *means*, the promotion of human happiness being the end.

A great number of the existing moral rules can be traced to a distinct historical origin, proving still more decisively that they are not the suggestions of a universal instinct of the human mind. The Mohammedan code of morals came from Mohammed; Confucius was the moral legislator of one large section of the Chinese. The making of the marriage tie irrevocable in Christendom was an exercise of papal authority in the 13th c., and has since been repealed in some Protestant countries, although retained in Catholic states. See DIVORCE, MARRIAGE. The sentiment which forbids the holding of human beings as slaves is chiefly the growth of the last two or three centuries.

Although the doctrine of intuitive morality is, in this view, denied, it is still admitted that there is such a power in the mind as Conscience, which warns us when we are doing wrong, and is to a certain extent a force to make us do right. But it cannot be shewn that we are born with any such principle, combining both enlightenment and motive power. Conscience is a *growth*. There are in our constitution certain primitive impulses that so far coincide with what is our duty, and therefore contribute to the formation of the Conscience; these are principally Self-preservation, or a regard to ourselves, and Sympathy, or a regard to others. There are many duties that we are prompted to for our own interest, such as telling the truth, in order that people may confide in us; obeying the laws, to avoid punishment, &c. But we cannot perform all our social duties if we look merely to ourselves. We must, in addition to prudence, have a source of *disinterested* action, inducing us both to avoid injuring our fellow-beings in the promotion of our own selfishness, and occasionally to sacrifice ourselves for the sake of others. Such a principle exists in our mental nature, although not of equal strength in all minds. Being provided with these two primitive springs of action, we are susceptible of being educated to the sense of moral obligation. The child is first taught obedience by penalties, and is made to associate pain with forbidden actions. This is the germ of conscience. Habits of avoiding what is prohibited under penalties are gradually formed, and the sense of Authority and Law is thereby acquired. When the powers of observation and reason come to maturity, the individual sees why the restrictions of duty have been imposed, and is then ready of his own accord, and apart from the fear of punishment, to behave rightly. The Conscience, grounded on Fear, then becomes the Conscience grounded on spontaneous approval.

Conscience thus follows, and does not precede, the experience of human authority. Authority, sanctioned by punishment, is the type and the starting-point, even when the conscience takes an independent flight, and adopts rules for itself different from those that entered into its education. The great mass of human beings have nothing more than the slavish conscience, or the habits imparted by the exercise of the parental and public authority, which shews what is the most natural foundation of moral sentiment. The persons that judge of right for themselves, instead of implicitly receiving the maxims peculiar to the society where they grow up, are so few as to be the exception everywhere; their conscience does not prove what is the usual endowment of human nature in this respect.

Inquiries of the nature of those above sketched, proceed upon the assumption that moral distinctions have their ground in the constitution of the world and of man's nature, and may be discovered by the exercise of human reason, as the other laws of the universe are. But practically, the rules of morality have, in almost all communities, been more or less dependent upon a belief in divine laws supernaturally revealed. The relation of these to scientific ethics will be considered under REVELATION.

ETHIO'PIA, the biblical *Kush*. Originally, all the nations inhabiting the southern part of the globe, as known to the ancients; or rather, all men of dark-brown or black colour, were called Ethiopians (Gr. *aithō—ōps*, sunburned). Later, this name was given more particularly to the inhabitants of the countries south of Libya and Egypt, or the Upper Nile, extending from 10°—25° N. lat., 45°—58° E. long.—the present Nubia, Sennaar, Kordofan, Abyssinia. The accounts which the ancients have left us with respect to this people are, even where they are not of an entirely fabulous nature, extremely scanty and untrustworthy, as both Greeks and Romans never got beyond Napata, 19° N. lat. We will just mention that from the Homeric age down to Ptolemy—who is somewhat better informed—these regions were peopled by Pygmies, Troglodytes (dwellers in caverns), Blemmyes (hideous men), Macrobii (long-lived men), &c., besides being divided into the lands of cinnamon, myrrh, of elephant-eaters, fish-eaters, tortoise-eaters, serpent-eaters, &c. The only portion of ancient records which does contain something akin to historical accounts, is that which refers to Meroë, an island formed by the rivers Astaphus and Astaboras, tributaries of the Nile. There stood, from times immemorial, an oracle of Jupiter Ammon. This, and the central portion of the island, together with the extraordinary fertility of its soil, the abundance of animals, metals, &c., made it not only the chief place of resort for all the inhabitants of the adjacent parts, especially the numerous nomad tribes, but also the emporium for India, Arabia, Ethiopia, Egypt, Libya, and Carthage. Thus it grew so rapidly, that about 1000 B.C. it counted among the most powerful states of the ancient world; and about 760, having ever since Sesostris been tributary to Egypt, it succeeded, under Sabacus, in shaking off the Egyptian yoke, and continued, in its turn, to hold Egypt for about sixty years. During the reign of Psammetichus, 240,000 Egyptians settled in Meroë, which, the greater part of the immigrants being artisans, traders, &c., rose still higher. Many new cities were built, and the state was in the most flourishing condition, when it was conquered by Cambyses, about 530 B.C. He fortified the capital town, and called it Meroë. After the destruction of Thebes by Cambyses, most of the inhabitants of that city took refuge there, and made the country still more Egyptian. Ergamenes transformed its theocracy into a military monarchy, in the 3d century. Under Augustus, Meroë was conquered, and a Queen Candace is mentioned as his vassal. Under Nero, nothing but ruins marked the place of this once powerful and highly civilised state. Up to this day, remnants of mighty buildings, covered with sculptures—representations of priestly ceremonies, battles, &c.—and half-defaced inscriptions hewn in rocks, besides rows of broken sphinxes and colossi, are frequently met with in those parts.

Their religion, art, form of government, and civilisation, generally being—in their chief features at least—so identical with the Egyptian as to have given rise to the question, which of the two nations imparted their knowledge to the other, we will refer the reader for these points to the article EGYPT; and will proceed now to say a few words on the history of the descendants of the ancient Ethiopians—the inhabitants of the present Habesch, or Abyssinia—as we derive it from their very poor and scanty native chronicles.

According to these, the son of Solomon and the Queen of Sheba (Makeda as they, Balkis as the Arabian historians call her), named Menilehek, was the first king of the Ethiopians. Few kings' names occur up to the time of Christ, when Bazen occupied the throne. The missionary Frumentius (330) found two brothers (Christians) reigning—Abreha and Azbeha. During the time of the Greek emperor Justin (522), King Elezbaas destroyed the state of the Homerites in Asia, in order to revenge their persecutions of Christians; and was canonised. From 960 to 1300, another dynasty, the Zagoean, held the chief power, all the members of the Solomonic dynasty, save one, having been murdered by Esal, who made her son king. In 1300, Ikon-Amlak, a descendant of this one scion of the house of David, who had fled to Sheba, regained possession of the country, and made Sheba, instead of Axum, the seat of government. To this day, his family rules the country. Frequent revolutions within, more especially brought about by the religious squabbles imported by the Portuguese towards the end of the 15th c., and a host of enemies all around—the most formidable of whom were wild nomad tribes of the desert—forced the kings more than once to apply for foreign help; amongst others, that of the Turks in 1508; and the affairs of the modern state have at all times been anything but prosperous. Special mention is made of King Zara-Jakob (Constantine), 1434—1468, who sent an embassy to the church-council at Florence; of Aznaf-Saged (Claudius), 1540—1559, during whose reign Christoph. de Gama from Portugal lived in Ethiopia, and made common cause with him against his enemies. This king also wrote a confession of faith, in which he defended his church both against Jesuits and the charge of leaning towards Judaism. Socinios (1605—1632) openly professed Roman views; but his son Facilides soon expelled the Jesuits and their friends from the country, and put an end to the Roman influence. Among these friends was also Abba Gregorius, later the friend of the great Ethiopologist Ludolf, who, having made his acquaintance at Rome, induced him to migrate to Gotha, where he also remained until his death. Under Joas (1753—1769), the Gallas, a nomad tribe, hitherto the mightiest and most dangerous enemies of the Ethiopians, not only gained admission to all the offices in the state, but acquired almost absolute power. One of them (Susul Michael), holding the place of Râsh, or prime-minister and chief-commander of the troops, proved a very great friend to Bruce, to whom he also intrusted the government of a province. Since Salt's visit, the country remains convulsed with internal revolutions, seditions, &c., there being several pretenders in the field. The taxes of the country are mostly paid in kind—raw material, metal, horses, &c. The king resides but rarely in the city, and for the most part remains with his soldiers in the camp. His official name is Negus, or, in full, Negus.Nagass Za-itjopja, King of the Kings of Ethiopia—alluding to the chiefs of the towns and provinces. The soldiers receive no pay, but rely on plunder; and are said to be very valorous.

Emigrants, as were beyond doubt the earliest settlers in Ethiopia, from the other side of the Arabian isthmus, it is but natural that the structure of their language, as well as that of their own bodies, should bear traces of their Shemitic origin. The reason of this emigration is contained in the very name of this language, which is called *Geez*—free, affording a most striking parallel to the designation *Franc*—French. Free places of habitation were what they came in search of. The name Ethiopian, or, as they call it, Ithiopjawan, they adopted from the Greeks at a very late period. This their oldest language, *Leshana Geez*, was suppressed by a royal decree of Ikon-Amlak, in the 14th c., and the Amharic adopted as the court language. Ever since, it has, with exception of the province of Tigré, where it is still spoken (with slight idiomatic changes), remained the *Leshana Mazhaf*, the language of books and of the church. It is exclusively used in writing, even of ordinary letters, and the educated alone understand it. Its general structure comes as close to that of the Arabic as a dialect can and must. A great many of its words are still classical Arabic; others resemble more the Hebrew and its two Chaldee dialects, the Aramaic and Syriac; others, again, belong to African dialects; and many, as the names of the months, are Greek. It has 26 letters, 22 of which bear the ancient Shemitic stamp, and exhibit the greatest likeness to the Phœnician, the common original alphabet; and seven vowels, including a very short *e*, which sounds precisely like the Hebrew Schĕwa. These vowels are represented by little hooks, and remain inseparably attached to their respective letters; and as the Geez, unlike all its sister-languages, is never written without vowels, the alphabet becomes a syllabary with 182 characters. Another difference exists in its being written from left to right—a circumstance from which some have concluded that the Greeks introduced writing in Ethiopia; forgetting, in the first place, that Greek itself was frequently written from right to left, and that Zend, certain cuneiforms, hieroglyphs, &c., are likewise written from left to right. We cannot enter here into the grammatical minutiæ of the language; we will only mention that out of the ten conjugations, eight are Arabic; that there is a double infinitive, but no participle and no dual; that the formation of the so-called plural, and of declension generally, point to that very remote period when the Hebrew and Arabic made use of the same grammatical processes. There are no diacritical marks employed in writing; the letters are not combined, and the words are separated by two dots.

Although there can be no doubt of the existence of a rich literature in a flourishing country like Ethiopia anterior to Christ, still, owing both to frequent internal convulsions, and the misguided zeal of the early Christian missionaries, who here and elsewhere considered it their first duty to destroy all the ancient records of which they could get hold, nothing but a few half-erased inscriptions have survived. The earliest existing document of post-Christian literature is a complete translation of the Bible, probably by Frumentius. See FRUMENTIUS. The Old Testament, probably a translation from the Alexandrine version of the LXX., consists of four parts: 1, the Law or Octateuchos (five books of Moses, Joshua, Judges, Ruth); 2, Kings; 3, Solomon; 4, Prophets, and two books of the Maccabees. The New Testament consists of—1, Gospels; 2, Acts; 3, Paulus; 4, Apostolus. A very peculiar book, Henoch, belongs also to the literature of the Old Testament. See ENOCH. The New Testament comprises likewise another book, Senodas, containing the pseudo-Clementine or apostolical constitutions. The Ethiopians have a liturgy (*Kanon Kedaso*—Holy Kanon) and a symbolico-dogmatical work (*Haimanota Abau*—Belief of the Fathers), containing portions of homilies of the Greek Fathers, Athanasius, Basil the Great, Chrysostom, Cyril, Gregory of Nyssa and Nazianzen. Besides these, they have martyrologies, called Synaxar. They employ in this their sacred literature a peculiar kind of rhythm without a distinct metre. Any number of rhyming lines forms a stanza, without reference to the number of words constituting the verse, or of verses constituting the stanza. They also use certain phrases as a refrain—not unlike the manner of the mediæval Hebrew Pizmon. See JEWISH LITURGY. As to general literature, they have neither a written book of laws, nor a grammar of their own language, nor, in fact, anything worth mentioning, except a *Chronicle of Axum* and *Chronicles of Abyssinia.* They are very fond, however, of riddles, wise saws, and the like, so fascinating to the Eastern mind. They have a Dictionary, but most of its explanations and translations are utterly wrong. No wonder the learned in Europe should have been sorely puzzled by such a language, and that they should, after long consideration, have pronounced it to be either 'Chaldee' or 'Indian,' while Bruce held it to be the language of Adam and Eve. Potgen, a Cologne church-provost, happening to be at Rome at the beginning of the 16th c., there made the acquaintance of native Ethiopians, and became the first to enlighten the world on the nature of this occult language. After him came the Carmelite Jacob Marianus Victorius from Reate, who wrote *Institutiones Linguæ Chaldææ S. Æthiop.* (Rome, 1548), an entirely worthless book; then Wemmers, who in 1683 published an Ethiopian grammar and dictionary. The principal investigator, however, is Hiob Ludolf from Gotha, who, aided by the Abba Gregorius before mentioned, and supported by his own extraordinary linguistic talents and indomitable energy, acquired such a power over this language, that notwithstanding the number of eminent Orientalists, such as Platt, Lawrence, Dorn, Hupfeld, Hoffmann, Roediger, Ewald, Isenberg, Blumenbach, &c., who have since his time bestowed much attention upon it, his books still hold the first place. It is hardly necessary to add, that the Ethiopian is one of the most important and indispensable languages to the Shemitic scholar, containing as it does a great many words and forms of a date anterior to the separation of the different Shemitic dialects. Among the most important Ethiopian books printed in Europe are the Psalms, edited with a Latin translation by Ludolf (Frankfort, 1701); the New Testament, in two volumes (Rome, 1548); the book of *Henoch* (Lond. 1840); *Ascensio Isaiæ Vatis*, with a Latin translation by Lawrence (Oxford, 1819); *Didascalia*, or apostolical constitution of the Abyssinian Church, with an English translation by Platt (Lond. 1834, &c.).—Ludolf's works are—*Grammatica Æthiopia* (Lond. 1661); *Lexicon Æthiopicum* (Frankfort, 1699); *Historia Æthiopica* (Frankfort, 1681). See also Heeren, *Historical Researches;* Cailliau, *Voyage à Meroë;* Salt, Bruce, Ruppell, &c., *Travels.*

E'THIOPS, or ÆTHIOPS (Gr. *aidō*, I burn, and *ops*, countenance; being of a black or burned countenance), is a term applied by the ancient chemists to certain oxides and sulphides of the metals which possessed a dull, dingy, or black appearance. Thus, *Ethiops Martialis* was the mixture of protoxide and peroxide of iron, known as the black oxide; *Ethiops*

Mineral, or *Ethiops Narcoticus*, the black gray sulphuret of mercury procured by triturating in a mortar a mixture of mercury and sulphur; and *Ethiops per se*, was obtained by agitating commercial mercury for weeks or months, when the oxygen of the air slowly formed the black oxide of mercury.

ETHMOI'D BONE, The (so called from *ēthmos*, a sieve), is one of the eight bones which collectively form the cavity of the cranium. It is of a somewhat cubical form, and is situated between the two orbits of the eye, at the root of the nose. Its upper surface is perforated by a number of small openings (whence its name), through which the filaments of the olfactory nerve pass downwards from the interior of the skull to the seat of the sense of smell, in the upper part of the nose. It consists of a perpendicular central plate or lamella, which articulates with the vomer and with the central fibro-cartilage, and thus assists in forming the septum or partition between the two nostrils. The lateral masses present a very complicated arrangement, and are so planned as to give in a small space a very large amount of surface, on which the filaments of the olfactory nerve are spread. In comparative anatomy, we find a direct ratio between the development of these masses and the acuteness of the sense of smell. See SMELL, ORGAN AND PHYSIOLOGY OF.

ETHNO'LOGY (Gr. *ethnos*, nation or race, and *logos*, discourse) is the science that treats of the varieties in the human race; their most marked physical, mental, and moral characteristics, when compared one with the other; their present geographical distribution on the globe; their history traced backwards, with the aid of written documents and natural or monumental remains, to the earliest attainable point; and finally, the languages of the various nations and tribes of mankind, whether still spoken or extinct, classified and compared, with the view, by their means, of determining the chief points of resemblance or dissimilarity among the nations of the earth. According to this definition, framed after the latest and best authorities, it is a science that involves in its study that of comparative physiology, also of geography, history and archæology, and comparative philology. It is therefore a mixed or composite science, embracing a variety of subjects formerly not thought to belong to it, but now deemed necessary for its successful cultivation. It has been often confounded with *ethnography*, in which is implied a simple description of the nations of the earth; but *ethnology* takes a wider range, and while it comprehends the former, embraces much besides; indeed, in its widest sense, it is now understood as involving a discussion of the important questions: 'What is species?' and 'What is variety?' also, of the doctrine of hybridity, and of the difficult problem concerning the origin of mankind; that is to say, a sifting of the evidence for or against the absolute unity of the human race.

Ethnology, however, is a science still comparatively in its infancy; and although it has made considerable progress since the researches of Camper and Blumenbach, especially in this country, owing to the indefatigable exertions of Dr Prichard, it is to be hoped that, as in the case of other sciences—geology, for instance, and comparative philology—also of modern growth, when it comes to be better understood, and more widely cultivated, apart from prejudice of whatever kind, its limits will be more accurately defined, and the study of it narrowed to a more reasonable area than it at present occupies.

As it is, there is no alternative but to treat of the subject according to the definition given above, which our space obliges us to do as briefly as possible.

No one can look at an Englishman, a Red Indian, and a Negro, without at once noticing the differences between the three, not only as regards the colour of their skin, but the shape of the skull, the texture of the hair, and the character of the several features, as eyes, lips, nose, and cheek-bones. What strikes the ordinary observer chiefly is, of course, the difference of complexion; but the anatomist is fully as much interested in the shape of the skull. The first thoroughly scientific writer who endeavoured to lay down a method of distinguishing between the different races of mankind by a comparison of the shape and size of the skull was Peter Camper, a distinguished Dutch anatomist of last century. He laid down a technical rule for ascertaining the *facial line*, and determining the amount of the *facial angle*, which he has thus described: 'The basis on which the distinction of nations is founded may be displayed by two straight lines, one of which is to be drawn through the *meatus auditorius* to the base of the nose, and the other touching the prominent centre of the forehead, and falling thence on the most advancing part of the upper jaw-bone, the head being viewed in profile. In the angle produced by these two lines may be said to consist not only the distinctions between the skulls of the several species of animals, but also those which are found to exist between different nations; and it might be concluded that nature has availed herself, at the same time, of this angle to mark out the diversities of the animal kingdom, and to establish a sort of scale from the inferior tribes up to the most beautiful forms which are found in the human species. Thus, it will be found that the heads of birds display the smallest angle, and that it always becomes of greater extent in proportion as the animal approaches more nearly to the human figure. Thus, there is one species of the ape tribe in which the head has a facial angle of 42 degrees; in another animal of the same family, which is one of those Simiæ most approximating in figure to mankind, the facial angle contains exactly 50 degrees. Next to this is the head of the African Negro, which, as well as that of the Kalmuk, forms an angle of 70 degrees; while the angle discovered in the heads of Europeans contains 80 degrees. On this difference of 10 degrees in the facial angle the superior beauty of the European depends; while that high character of sublime beauty which is so striking in some works of ancient statuary, as in the head of Apollo, and in the Medusa of Sisocles, is given by an angle which amounts to 100 degrees.'

Camper's method, however, although ingenious, was found practically to be of little use, and was soon abandoned for the vertical method, or *norma verticalis*, of viewing the human skull, invented by Blumenbach. The object sought in comparing and arranging skulls being to collect in one survey the greatest number of characteristic peculiarities—'The best way,' says Blumenbach, 'of obtaining this end is to place a series of skulls with the cheek-bones on the same horizontal line resting on the lower jaws; and then viewing them from behind, and fixing the eye on the vertex of each, to mark all the varieties in the shape of parts that contribute most to the national character, whether they consist in the direction of the maxillary and malar bones, in the breadth or narrowness of the oval figure presented by the vertex, or in the flattened or vaulted form of the frontal bone.' Founding upon this mode of admeasurement applied to a large collection of skulls of different nations, accumulated by himself, Blumenbach classified the human family into the following five varieties—viz., the Caucasian, Mongolian, Ethiopian, Malay, and American. In the first of these—which he made to include the Caucasians or Circassians Proper, the Celts, the Teutons, the Shemites, the Libyan family, the Nilotic family, and the Hindustanic family—the skull is large and oval, the forehead expanded, the nasal bones arched, the chin full, and the teeth vertical. In the second—which embraces the Chinese and Indo-Chinese, the natives of the polar regions, the Mongol Tartars, and the Turks—the skull is oblong, but flattened at the sides, the forehead low and receding, the nose broad and short, and the cheek-bones broad and flat, with salient zygomatic arches. In the third—embracing the Negroes, Kafirs, Hottentots, Australians, Alforians and Oceanic Negroes—the skull is long and narrow, the forehead low, the nose broad and flat, the cheek-bones prominent, the jaws projecting like a muzzle, the lips thick, and the chin small. In the fourth—embracing the Malays and Polynesians generally—the skull is high and square, the forehead low, the nose short and broad, and the jaws projecting. In the fifth—embracing the American family and the Toltican family—the skull is small, with the apex high, and the back part flat, the forehead receding, the cheek-bones high, the nose aquiline, the mouth large, and the lips tumid.

This classification of the human family, with the added characteristics under each class, of complexion, hair, and eyes, is, upon the whole, the most popular, Blumenbach having taken considerable pains to elaborate it, and present it to the world in a form acceptable to scientific inquirers. Later researches, however, have proved it to be not quite tenable. Thus, Cuvier reduced the five classes of Blumenbach to three—viz., the Caucasian, Mongolian, and Ethiopian, treating the Malay and American as subdivisions of the Mongolian. Jacquinot does the same. Dr Prichard, who brought to the study of ethnology not only a large acquaintance with physiology, but a considerable knowledge of languages, admits a greater number of varieties than Blumenbach, but divides his Caucasian class into two independent groups, which he calls the Syro-Arabian or Semitic, and the Aryan or Indo-Germanic. Moreover, he objects to the term Caucasian, as representing the notion that mankind had their origin on mountain heights. For himself, Prichard holds with the view that it was rather on the banks of large rivers and their estuaries that the primitive nations developed themselves. 'The cradles or nurseries of the first nations, of those at least who became populous, and have left a name celebrated in later times, appear to have been extensive plains or valleys, traversed by navigable channels, and irrigated by perennial and fertilising streams. Three such regions were the scenes of the earliest civilisation of the human race, of the first foundation of cities, of the earliest political institutions, and of the invention of the arts which embellish human life. In one of these, the Semitic or Syro-Arabian nations exchanged the simple habits of wandering shepherds for the splendour and luxury of Nineveh and Babylon. In a second, the Indo-European or Japetic people brought to perfection the most elaborate of human dialects, destined to become in after-times, and under different modifications, the mother-tongue of the nations of Europe. In a third, the land of Ham, watered by the Nile, were invented hieroglyphical literature, and the arts in which Egypt far surpassed all the rest of the world in the earlier ages of history.' Dr Prichard, in his well-known *Natural History of Man*, commences with a description of these three divisions of the human race, not as discriminated one from the other by the form of the skull, but as comprising nearly all the civilised communities, and indeed most of the tribes of people known to antiquity. 'They were neither nomades nor savages, nor do they display in their crania either of the forms principally belonging to races in those different states of existence. They had all heads of an oval or elliptico-spherical form, which are observed to prevail chiefly among nations who have their faculties developed by civilisation.' As they cannot, however, by any means be made to comprehend all the types of man, after the Egyptians, he describes the great body of the nations of Africa, embracing tribes sunk in the lowest state of degradation; and after the Aryans, or Indo-Europeans, the people of High Asia, chiefly nomades, inhabiting vast steppes, and never rising in the scale of civilisation beyond the condition of wandering shepherds, though in this capacity possessing some wealth, and acquainted with the use of clothing, tents, and wagons. 'These classes of nations,' he observes, 'have different physical characters. Among the African savages we find the *prognathous* form of the head and all its accompaniments; and these traits display themselves in proportion to the moral and physical degradation of the race. In Northern Asia, most of the inhabitants have the pyramidal and broad-faced skulls.' Referring our readers to the articles ARYAN RACE, EGYPT, and SEMITIC RACE respectively, for more detailed information on the subject of these three grand divisions of mankind, we shall here only notice Dr Prichard's subdivisions of one of them, namely, the Aryan race.

The great Aryan or Indo-European race, which extends itself from the mouth of the Ganges to the British Islands and the northern extremities of Scandinavia, divides itself, according to Prichard, into two branches—viz., the parent stock in Asia, and the colonies that it successively sent forth into Europe. The Asian branch comprises: 1. Hindus; 2. Persians; 3. Afghans; 4. Baluchi and Brahui; 5. Kurds; 6. Armenians; and 7. Ossetines. The collective body of the European nations are now generally regarded as a series of colonies from Asia. The proof turns mainly on a comparison of languages; the ancient Sanscrit being regarded by the most competent judges as the parent not only of the Greek and Latin languages, but of the Teutonic, with its several ramifications of the Slavonic, Lettish, Lithuanian, and even Celtic. Dr Prichard himself was the first to point out the affinity of the Celtic with the Sanscrit, Greek, Latin, and Teutonic, in a memoir published by him in 1831, on the *Eastern Origin of the Celtic Nations*. Later philologers have confirmed the view taken by him, and he is perhaps correct also in the conclusion, that they were the first great immigration of the Aryans into Europe, who were afterwards conquered, and their numbers considerably reduced by fresh advancing colonies from the same parent hive. But there are other nations or tribes of Europe which no efforts of the philologists have succeeded in tracing to the Aryan stock; such are the Lapps, Finns, Tschudes, and Ugrians of the North, and the Euskaldunes, now principally represented by the Basques in the West. To these, Dr Prichard has given the appellation of Allophylian (Gr. *allos*, another, and *phule*, tribe), thereby signifying their independence of the Aryan stock. The progenitors of these tribes were probably the inhabitants of Europe, prior to the first Aryan immigration.

After these several races, Dr Prichard treats of the native tribes of the austral seas and the great Southern Ocean, and finally, of the native inhabitants of America. In every case, he carefully describes the physical appearance or structure, the geographical *habitat*, history, and migrations (if any), the language, and the moral and psychical attributes of the nation or tribe immediately brought under notice. His information has generally been obtained from the best sources, and hence his works may be regarded as a storehouse of knowledge upon the subject of ethnology.

But both before and since Blumenbach and Prichard, there have been several classifications of the human race proposed, the simplest of which is perhaps that of Dr Latham, into 1. Mongolidæ; 2. Atlantidæ; 3. Japetidæ. This writer is properly regarded as the chief living exponent of the science of ethnology in this country. Following in the track of Prichard, and possessing, like him, a considerable acquaintance with physiology and history, he distances him altogether in the department of comparative philology. His contributions to the science of ethnology, borrowed from this particular branch of study, are consequently of the highest value. But there is one important question, with respect to which the suffrages of the best philologers are rather with Prichard than with Latham—viz., the origin of the Aryan or Indo-European race. Prichard, as we have seen, refers it to Asia, while Latham claims it for Europe.

Other classifications might be mentioned; but these we shall leave, especially as the best authorities, even those of rival schools, do not at present much insist on classification; probably from a conviction of the hopelessness of laying down any definite scheme in which all could be brought to agree, in the existing state of the science. That a classification will at last come, when more facts shall have been accumulated, there is every reason to believe; but this will scarcely happen before one great question at least shall have been set at rest, which now divides the cultivators of ethnology into two hostile camps.

This question is the all important one: 'What is species?' Men may go on classifying, but what do they classify? Is it species, or is it varieties? Prichard and Latham in this country, with a large band of followers, maintain that the numerous tribes of men upon the earth constitute essentially but one species; that they have all sprung from a single pair; and that the differences observable among them, even in the extreme cases of the European and the Negro, may all be accounted for by the influences of climate, food, and other circumstances operating through a long series of ages, and which thus produce the peculiar characteristics that no one can fail to notice in a comparison of one with the other. It is a well-ascertained fact in respect of the animal and vegetable kingdoms generally, that although by the union of two species hybrid animals and hybrid plants may be produced, especially in the domestic state, still there is no power of reproduction among the hybrids themselves; in mules, for instance, and the offspring of the dog and the wolf, also in various tribes of birds; nature appearing to have set her ban upon any permanent invasion of her law with respect to the distinctness of species. With the races of man, however, this is not the case. The European and the Negro intermarry, likewise the Spaniard and the Indian of South America; both have offspring, and that offspring is quite as capable of reproduction as individuals of the same parent nation. Hence it is argued, that all nations and tribes of men are originally of the same species. The diversities among them, say Prichard and his school, are not greater than we continually see among the different breeds of dogs, horses, sheep, and oxen, which are nevertheless universally regarded as nothing more than varieties. Indeed, within the historical period, and so late even as since the discovery of America in the 15th c., such marked changes have taken place in the animals transported to that continent from Europe, that they would scarcely seem to have descended from the same stock. And if this has been the case among the lower animals within such a limited period as that mentioned, is nothing to be allowed for the influence of climate and other agencies in modifying the aspect of man, and producing those varieties observable in him after a long lapse of ages? Man, although a cosmopolite, and subduing all things to himself, 'capable of living under every clime, from the shores of the Icy Sea, where the frozen soil never softens under his feet, to the burning sands of equatorial plains, where even reptiles perish from heat and drought,' is nevertheless himself to a certain extent the creature of the circumstances by which he is surrounded. 'He modifies the agencies of the elements upon himself; but do not these agencies also modify him? Have they not rendered him in his very organisation different in different regions, and under various modes of existence imposed by physical and moral conditions? How different a being is the Esquimaux, who, in his burrow amid northern ices, gorges himself with the blubber of whales, from the lean and hungry Numidian, who pursues the lion under a vertical sun! And how different, whether compared with the skin-clad and oily fisher of the icebergs, or with the naked hunter of the Sahara, are the luxurious inmates of eastern harems, or the energetic and intellectual inhabitants of the cities of Europe!' Notwithstanding all these differences, however, inasmuch as no impediment whatever exists to the perpetuation of mankind when the most dissimilar varieties are blended together, 'we hence derive a conclusive proof, unless there be in the instance of human races an exception to the universally prevalent law of organised nature, that all the tribes of men are of one family.' This conclusion of Prichard, based upon physiological grounds, is strongly supported by Dr Latham with arguments drawn from philology. Dr Latham, taking it as a matter of fact that all these languages of mankind have had a common origin, he argues from it in favour of an original unity of the race. This common origin of languages, however, is a thing by no means proved; for although Klaproth, Fürst, and Delitzsch have taken great pains to establish an affinity between the Sanscrit and the Hebrew, M. Renan and other excellent authorities regard the attempt as unsuccessful, and, even were it otherwise, 'the Chinese,' says a late writer (Farrar, *Essay on the Origin of Language*), 'must always remain a stumbling-block in the way of all theories respecting a primitive language. Radical as is the dissimilarity between Aryan and Semitic languages, and wide as is the abyss between their grammatical systems, yet they almost appear like sisters when compared with the Chinese, which has nothing like the organic principle of grammar at all. Indeed, so wide is the difference between Chinese and Sanscrit, that the richness of human intelligence in the formation of language receives no more striking illustration than the fact, that these languages have absolutely *nothing* in common except the end at which they aim. This end is in both cases the expression of thought, and it is attained as well in Chinese as in the grammatical languages, although the means are wholly different.'

Having thus made the reader in some degree acquainted with the views of Drs Prichard and Latham on the subject of ethnology, we now proceed to inform him of the totally different views and conclusions of the American school of ethnology. This school was founded by the late Dr Morton of Philadelphia, an erudite and active man of science, who laboured for many years in forming a collection of human crania of all nations, and of ancient as well as modern ages, with the design of still further carrying out Blumenbach's researches into the varieties of mankind by a comparison of crania, according to the method he had proposed. This collection of crania was begun in 1830, and at the time of Morton's death in 1851, amounted to the large number of 918 human crania, to which were afterwards added 51; and it, besides, included 278 crania of mammals, 271 of birds, and 88 of reptiles—in all, 1606 skulls, being the largest collection of the kind ever formed, and which, fortunately for the purposes of science, is now deposited in the Museum of the Academy of Natural Sciences at Philadelphia. Simultaneously with this accumulation of crania, Dr Morton carried on his researches in ethnology, not, however, in the restricted sense in which he began, following Blumenbach's classification, but availing himself of the latest discoveries of Prichard, and the other English and continental writers. One of the results of his labours was the publication, in 1839, of a handsome work, entitled *Crania Americana*, which was followed in 1844 by the *Crania Ægyptiaca*, in the collection of which he had been much aided by Mr G. R. Gliddon. 'In this work,' says his biographer, Dr Patterson, 'Morton found himself compelled to differ in opinion from the majority of scholars, in regard to certain points of primary importance.' The great question of the unity or diversity of mankind in their origin was one that early forced itself upon his attention, and the conclusion at which he arrived, after much patient investigation, was in favour of the latter view. He was slow to publish any opinion on the subject, probably reserving it for a work upon which he was engaged, to be entitled the *Elements of Ethnology*. His opinion, however, was well known to his friends. In a note to a paper in *Silliman's Journal* for 1847, he says: 'I may here observe that whenever I have ventured an opinion on this question, it has been in favour of the doctrine of primeval diversities among men; an original adaptation of the several races to those varied circumstances of climate and locality which, while congenial to the one, are destructive to the other; and subsequent investigations have confirmed me in these views.' In a letter to Dr Nott, dated January 1850, he lays down the following proposition: 'That our species had its origin, not in one, but in several or in many creations, and that these diverging from their primitive centres, met and amalgamated in the progress of time, and have thus given rise to those intermediate links of organisation which now connect the extremes together. Here is the truth divested of mystery; a system that explains the otherwise unintelligible phenomena so remarkably stamped on the races of men.' His latest utterance upon the subject is contained in a letter written to Mr G. R. Gliddon, in April 1851, only a fortnight before the writer's decease, which concludes as follows: 'The doctrine of the original diversity of mankind unfolds itself to me more and more with the distinctness of revelation.' His views upon this and other points of dispute among ethnologists have been since embodied in a remarkable work, entitled *Types of Mankind; or, Ethnological Researches based upon the Ancient Monuments, Paintings, Sculptures, and Crania of Races, and upon their Natural, Geographical, Philological, and Biblical History; illustrated by Selections from the inedited Papers of S. G. Morton, M.D., and by additional Contributions from Professor L. Agassiz, W. Usher, M.D., and Professor H. S. Patterson.* By J. C. Nott, M.D., and G. R. Gliddon (Philadelphia, 1854). In this composite work, perhaps the most remarkable feature is the paper contributed by the celebrated naturalist, Professor Agassiz, in support of Dr Morton's theory as to the original diversity of the human races.

The paper by Agassiz is entitled, *Sketch of the Natural Provinces of the Animal World, and their Relation to the Different Types of Man.* It was drawn up by the writer from a conviction that much might be gained in the study of ethnography by observing the natural relations between the different races of man and the plants and animals inhabiting the same regions. The sketch given by him is intended to shew, that 'the boundaries within which the different natural combinations of animals are known to be circumscribed upon the surface of our earth coincide with the natural range of distinct types of man.' Such natural combinations of animals circumscribed within definite boundaries are called *Faunæ*, whatever be their home—land, sea, or water.' There are eight regions of the earth, according to Agassiz, each containing its own faunæ, and its own peculiar type of man; and his main conclusion from a consideration of these several faunæ is as follows: 'That the diversity among animals is a fact determined by the will of the Creator, and their geographical distribution part of the general plan which unites all organised beings into one great organic conception; whence it follows that what are called human races, down to their specialisation as nations, are distinct primordial forms of the type of man.' Messrs Nott and Gliddon, in their work quoted, appeal triumphantly to this theory of Agassiz in support of their view as to the primitive diversity of the races of mankind; and in a subsequent work, *Indigenous Races of the Earth* (Philadelphia, 1857), have inserted a further communication from the writer, in which, while he reiterates his formerly expressed opinion, that the races of man, so far as concerns their geographical distribution, are subject to the same circumscription as the other members of the animal kingdom, he observes: 'Even if this fact stood isolated, it would shew how intimately the plan of the animal creation is linked with that of mankind. But this is not all. There are other features, occurring among animals, which require the most careful consideration, inasmuch as they bear precisely upon the question at issue, whether mankind originated from one stock or from several stocks, or by nations. These features, well known to every zoologist, have led to as conflicting views respecting the unity or plurality of certain types of animals as are prevailing respecting the unity or plurality of the origin of the human races. The controversy which has been carried on among zoologists upon this point, shews that the difficulties respecting the races of men are not peculiar to the question of man, but involve the investigation of the whole animal kingdom—though, strange as it may appear, they have always been considered without the least reference to one another.'

This theory of Agassiz, it must be stated, has been much controverted, as likewise the opinions generally of Dr Morton and the American school of ethnology, partly on biblical, and partly on scientific grounds. Indeed, from the conflict of opinions as to the origin of the human race, if the solution of this question were the sole object of ethnology, the science might be said to be in a very unsatisfactory state. But this is not the case. The question at issue is one that may well be left in abeyance for the present. Without it, the field of inquiry is sufficiently wide, and is well cultivated by skilled labourers, who continually bring the product of their researches in physiology, geography, archæology, and comparative philology to enrich and fructify the newly turned-up soil.

Subjoined is a tabular view of the different races of mankind, according to the classification of Dr Latham:

I. MONGOLIDÆ.

Physical Characteristics.—Face broad and flat; frontal profile retiring or depressed; maxillary profile moderately prognathic or projecting, rarely orthognatic; eyes often oblique; skin rarely a true white, rarely a jet-black; irides generally dark; hair straight, and lank, and black, rarely light-coloured, sometimes curly, rarely woolly. *Languages*—aptotic and agglutinate, rarely with a true amalgamate inflection. See LANGUAGE. *Distribution*—Asia, Polynesia, America. *Influence upon the history of the world*, material rather than moral.

A. ALTAIC MONGOLIDÆ.—1. *Seriform stock*, embracing Chinese, Tibetans, Anamese, Siamese, Kambojians, Burmese, the Môn, and numerous unplaced tribes. 2. *Turanian stock*, embracing the Mongolian branch, the Tungusian branch, the Turk branch, and the Ugrian branch.

B. DIOSCURIAN MONGOLIDÆ.—1. Georgians. 2. Lesgians. 3. Mizjeji. 4. Irôn. 5. Circassians.

C. OCEANIC MONGOLIDÆ.—1. *Amphinesian stock*, embracing Protonesians, Polynesians, Malegasi (?). 2. *Kelœnonesian stock*, embracing the natives of New Guinea, New Ireland, Solomon's Isles, Louisade, New Caledonia, Australia, and Tasmania.

D. HYPERBOREAN MONGOLIDÆ.—1. Samöeids. 2. Yeniseians. 3. Yukahiri.

E. PENINSULAR MONGOLIDÆ.—1. Koreans. 2. Japanese. 3. The Aino. 4. Koriaks. 5. Kamskadales.

F. AMERICAN MONGOLIDÆ.—Embracing the various native tribes of North and South America.

G. INDIAN MONGOLIDÆ.—1. Tamul. 2. Pulinda. 3. Brahui. 4. Indo-Gangetic. 5. Purbutti. 6. Cashmirian. 7. Cingalese. 8. Maldivian.

II. ATLANTIDÆ.

Physical Characteristics.—Maxillary profile projecting; nasal, generally flat; frontal, retiring; cranium, dolikhokephalic; the parietal diameter being generally narrow; eyes rarely oblique; skin often jet-black, very rarely approaching a pure white; hair crisp, woolly, rarely straight, still more rarely light-coloured. *Languages*, with an agglutinate, rarely an amalgamate inflection. *Distribution*, Africa. *Influence on the history of the world*, inconsiderable.

A. NEGRO ATLANTIDÆ.—Embracing various negro tribes.

B. KAFFRE ATLANTIDÆ.—Kaffre tribes, &c.

C. HOTTENTOT ATLANTIDÆ.—1. Hottentots. 2. Saabs. 3. Dammaras.

D. NILOTIC ATLANTIDÆ.—1. Gallas. 2. Agows and Falasha. 3. Nubians. 4. Bishari. 5. M'Kuafi, &c.

E. AMAZIRGH ATLANTIDÆ.

F. EGYPTIAN ATLANTIDÆ.

G. SEMITIC ATLANTIDÆ.—1. Syrians. 2. Assyrians. 3. Babylonians. 4. Beni Terah (Edomites, Jews, Samaritans, &c.). 5. Arabs. 6. Ethiopians. 7. Canaanites, &c.

III. JAPETIDÆ.

Physical Characteristics.—Maxillary profile but little projecting; nasal often prominent; frontal sometimes nearly vertical; face rarely very flat, moderately broad; skull generally dolikhokephalic; eyes rarely oblique; skin white or brunette; hair never woolly, often light-coloured; irides black, blue, gray. *Languages*, with amalgamate inflections, or else anaptotic; rarely agglutinate, never aptotic. *Distribution*, Europe. *Influence on the history of the world*, greater than that of either the Mongolidæ or the Atlantidæ, moral as well as material.

A. OCCIDENTAL JAPETIDÆ.—Kelts.

B. INDO-GERMANIC JAPETIDÆ.—1. *European class*, embracing Goths, Teutons (Mœso-Goths, High and Low Germans, Franks), Scandinavians, Sarmatians, Slavonians (Russians, Servians, Illyrians, Bohemians, Poles, Serbs), Mediterranean Indo-Germans (Hellenic branch, Italian branch). 2. *Iranian class*, embracing Persians, Kurds, Beluchi, Patans (Afghans), Tajiks, Siaposh, Lugmani, Dardoh, Wokhan. 3. *Unplaced stocks*, Armenians, Iberians, Albanians. 4. *Extinct stocks*, Pelasgi, Etruscans, populations of Asia Minor.

E'THYL (symbol, C_4H_5) is the starting-point of the family group, of which ordinary ether and alcohol are members.

Ethyl,	C_4H^5.
Ether,	C_4H_5O, Oxide of Ethyl.
Alcohol,	C_4H_5O,HO, Hydrated Oxide of Ethyl.

It may be prepared by acting upon iodide of ethyl by granulated zinc, when the ethyl is liberated, and may be obtained as a colourless, inflammable gas, of an agreeable odour, insoluble in water, but soluble in alcohol.

ETHY'LAMINE is a substance strongly resembling ordinary ammonia or hartshorn in odour and other properties. It is found in coal-tar, in the oil obtained during the destructive distillation of bones, in the gases evolved during putrefaction, and may be produced by certain complicated chemical processes. Ethylamine is a mobile liquid of specific gravity 696 (water = 1000), and boils at 66° F. It has a strong ammoniacal odour, has an alkaline action with colouring matters, forms white fumes with strong acids, and in composition is analogous to gaseous ammonia (NH_3 or NHHH), with one of the atoms of hydrogen replaced by ethyl (C_4H_5O or Ae), and is represented by the symbol NHHAe or NH_2Ae.

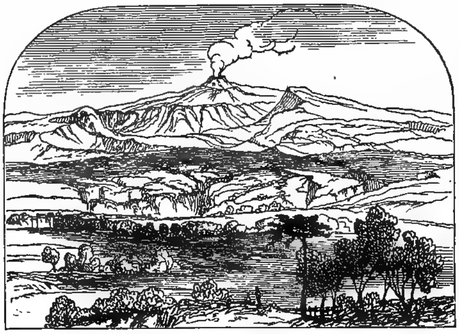
ETIENNE, ST, an important manufacturing town of France, in the department of Loire, is situated on both banks of the Furens, an affluent of the Loire, in the centre of a valuable and extensive coal-field, 30 miles south-south-west of Lyon by rail, and about 288 miles south-south-east of Paris. It is surrounded by coal-mines, is seated upon coal-deposits, and has galleries driven even beneath its streets. The stream on which the town is built furnishes invaluable water-power to move its machinery, and its waters are also of great use for tempering iron and steel. The old town of St E. is badly built, and the new town, which has sprung up very quickly, is destitute of architectural harmony. The newer houses are built of a fine white sandstone, and are frequently five and six stories in height; but they rapidly become tarnished and begrimed by the perpetual cloud of coal-smoke which hangs over the town. The most noteworthy building is the Hôtel-de-Ville, which contains the *Musée Industriel*, with specimens of the manufactures of the town, and of the minerals and fossils of the neighbourhood. St E. is famous for its manufactures of ribbons and firearms. The ribbon-manufactories contain 30,000 looms, and the annual value of their produce is estimated at 60,000,000 francs (£2,375,000) in value. They are unrivalled in elegance of design, and in richness and delicacy of colour, and are exported to all parts of the world. There are extensive private manufactories of firearms, besides an imperial firearms manufactory, which supplies most of the muskets of the French army. St E. has also extensive manufactures of bayonets, scythes, nails, saw-blades, foils, anvils, vices, files, and also of silks, velvets, lace, embroidery, muslins, glass, leather, and paper. From the coal-field on which St E. is situated, about 600,000 tons of coal are raised annually. On the 1st January 1856, St E. was constituted the capital of the department, in place of the town of Montbrison. St E. arose originally from a castle built in the 10th c. by the Counts of Forez. It increased greatly in the 15th c., and in 1771 it had 20,000 inhabitants; in 1851, 49,614; in 1856, 99,677; and in 1861, 110,000 inhabitants.

ETIQUE'TTE (Fr. a ticket, supposed to be from the Celtic *tocyn*, a little piece or slip—a token). Originally, etiquette signified a little piece of paper affixed to a bag or other object to signify its contents. The word came probably to possess the secondary meaning which we now attach to it, of the forms or decorums observed in the intercourse of life, more particularly on state occasions, from its having been customary to deliver such tickets, instructing each person who was to take part in the ceremony as to the part which he was expected to play. The cards which are still delivered to the mourners at funerals, and those on which the order of the dances is set forth at balls and evening parties, are of this nature. Popular publications are constantly issuing from the press for the purpose of teaching etiquette, or the rules of behaviour in good society. They will, for the most part, be found far less trustworthy than the promptings of nature, where the individual possesses a reasonable amount of reverence for others, and respect for himself. Yet there are certain conventionalities which can only be learned by instruction of some kind, or by observation, and the observation may be attended with unpleasant circumstances.

E'TIVE, a sea-loch in the north of Argyleshire, running inland from the Firth of Lorn, 20 miles east and north-east, with a breadth of a quarter to three miles. It is bordered by granite in its upper part, and by trap in its lower. Near its mouth, there is mica-slate on the north side, and Permian strata on the south. The river Awe, the outlet of Loch Awe, falls into the loch at the bend, where also is the ferry of Bunawe, and the small river Etive falls into it at its north-east end. The loch abounds in seals, salmon, porpoises, and cod. The scenery around the upper half of the loch is grand and romantic. To the east rise Ben Cruachan, 3670 feet, and Ben Starive, 2500 feet, and to the north Ben Mahrgage. The loch admits small coasting-vessels. Ardchattan Priory, founded in the 13th c., on the site of a monastery of the 6th or 7th c., is now in ruins. Connel Ferry, in the lower part of the loch, and near a vitrified fort, is only 680 feet broad, and is a very turbulent cataract, three or four feet high at half-tide, caused by a sunken reef of rocks, partly bare at low water. At the south side of the mouth of Loch E., three miles north of Oban, on a projecting conglomerate rock 10 to 30 feet high, are the ruins of Dunstaffnage Castle, the ancient stronghold of the Macdougals, a building in what is called the Edwardian style of the end of the 13th or beginning of the 14th c., with walls 400 feet in circumference, 30 to 50 feet high, and 10 feet thick, and with three round towers. Dunstaffnage is supposed by some to have been the seat of the Dalriadic Scottish monarchy (see DALRIADA), and from this place the famous slab or Stone of Destiny (Lia Fail), now in the coronation-chair, Westminster Abbey, is said to have been taken in 843 by Kenneth Macalpine to Scone, whence Edward I. removed it to London.

E'TNA, or **ÆTNA** (now MONTE GIBELLO), is the largest volcano in Europe. It is an isolated mountain, situated on the eastern coast of Sicily, and cut off from the chain of mountains which run parallel with the northern shore of the island, by a small valley, through which flows the Alcantara, and from the southern chain by a larger valley, which forms the basin of the Giaretta. Its eastern side rises directly from the Mediterranean, thirty miles of coast being formed by the streams of its lavas. Its base is almost 90 miles in circumference, and from this it rises like an immense cone to the height of 10,874 feet.

The history of E. does not carry us far back geologically; an active volcano in the later portion of the Tertiary period, it continues still to pour forth materials; and the ejected ashes, dust, and lapilli, together with the streams of molten lava, have, in the course of untold ages, built up this immense mountain. One central crater has been the prevailing outlet for these materials, and they have consequently arranged themselves into one central and dominant mound—the cone-shaped E.; but innumerable secondary and surrounding craters, each forming, by its ejected matter, an external smaller cone, exist on Etna. Many of these, in the progress of the growth of the mountain, have been covered and hid by the more recent eruptions. Eighty of them may be counted surrounding the upper portion of E., many being hills of considerable altitude, but all of them appearing only as trifling irregularities when viewed at a distance as subordinate points of so imposing and colossal a mountain. Seen from the summit, they present a beautiful aspect; some bare and barren, others covered with the dark and sombre pine, or with the gayer and more varied foliage of the oak, the beech, and the hawthorn, and all arranged in picturesque groups of various heights and sizes. But the most remarkable feature in E. is the Val del Bove, an immense gully excavating the eastern flank of the mountain, five miles across, and surrounded by nearly vertical precipices from 1000 to 5000 feet high, on which are shewn sections of innumerable lava-streams and beds of scoriæ, traversed by highly inclined dikes. It has a singularly dreary and blasted appearance.



Distant View of Etna.

The summit of E. rises considerably above the line of vegetation, and consequently presents, except where covered with snow, a dreary waste of black lava, scoriæ, and ashes, in the centre of which, in a desolate plain, rises the crater-bearing cone. This is called the Desert region. It is followed by six or seven miles of the Woody region, in which luxuriant forests of pine, oak, beech, poplar, and hawthorn abound, together with rich pasturage for herds and flocks. A varying breadth of from two to eleven miles of cultivated region surrounds the base of Etna. Its great products are corn, oil, wine, fruit, and aromatic herbs.

The first recorded eruption of E. took place 476 B.C. The most remarkable that have occurred since are the following: 1169 A.D., when Catania and 15,000 of its inhabitants were destroyed; 1527, in which two villages and many human beings perished; the eruption which continued at intervals from 1664 to 1673, and destroyed many villages with their inhabitants. Numerous chasms were formed at this time; from one several miles long and four or five feet wide were emitted a bright light and strong sulphurous vapour; from another, black smoke and quantities of stones were given out; and from others, streams of lava. In 1673, an immense volume of salt (?) water rushed down the mountain: by some, it is supposed to have been ejected from the crater, but it is more probable that it arose from the sudden melting of the snows which covered the summit of the mountain. The last great eruption took place in 1852. Immense clouds of ash-gray dust were ejected, covering the whole of the surrounding country. From two new mouths on the eastern flank there issued vast torrents of lava, one taking the direction of Zaffarana, the other flowing towards Giarra. The one stream was two miles broad, and at one time as much as 170 feet deep. It moved at the rate of about 600 feet in the hour; but when it descended abrupt cliffs on the mountain side, it was precipitated like a torrent in fiery cascades.

The minerals peculiar to volcanic rocks occur at E., such as chrysolite, zeolite, selenite, alum, nitre, vitriol, copper, mercury, and spicular iron.

ETOLIA. See ÆTOLIA.

E'TON, a town in the south of Buckinghamshire, on the left bank of the Thames, 42 miles south-south-east of Buckingham, and 22 miles west-south-west of London, near the Slough station of the Great Western Railway. It lies opposite to Windsor, in Berkshire, with which it is connected by a bridge over the Thames. Though in separate counties, these two towns really form one. E. chiefly consists of one long well-paved street, and is mainly dependent on the college. Pop. (1861) 3122, exclusive of the Eton boys.

ETON COLLEGE is one among the most famous educational establishments in England. It was founded in 1440 by Henry VI., under the title of 'The College of the Blessed Mary of Eton beside Windsor.' The original foundation consisted of a provost, 10 priests, 4 clerks, 6 choristers, 25 poor grammar-scholars, a master, and 25 poor infirm men. The king provided for the establishment out of his own demesne lands and the estates of certain alien priories. A supplementary charter was granted in 1441, in which year also the College buildings were commenced. Henry was very solicitous that the work should be of a durable kind. Some of the buildings were finished in 1443, and were handed over by the royal commissioners to the provost, clerk, and scholars. Political troubles of various kinds retarded the completion of the buildings till 1523. Bishop Waynfleete was the first head-master, and afterwards a munificent supporter of the College. The institution passed through much peril in the reign of Edward IV., and again in the time of the Commonwealth; but it surmounted the dangers, and the increasing value of its estates brought in a large income.

The present foundation consists of a provost, 7 fellows (one of whom is vice-provost), 3 conducts, 7 clerks, 10 lay-clerks, 70 scholars, and 10 choristers, besides officers and servants. Most of the scholars are, at the age of 17, elected to valuable scholarships at King's College, Cambridge; several smaller scholarships at other colleges, both at Oxford and Cambridge, together with sundry exhibitions and prizes, are also open to them. Among these is a prize for the French language, given by the late Prince Consort. The scholars are lodged within the College walls.

The main portion of the establishment, however, numbering nearly 900, consists of the *oppidans*, students who live out of the college, and whose friends pay liberally for their education. The tuition is the same for them as for the *collegers* or scholars. There are an upper and a lower school, managed by a head-master and lower master, with a large staff of assistants. Considerable discussion has taken place within the last few years concerning the kind of education received at Eton, the cost at which it is obtained, and the enormous incomes derived by some of the officials. The course of education has not undergone much change, except that the study of mathematics has been recently (1848) made a necessary part of the school business; it is still of the medieval character, which regards Greek and Latin as the basis of all good education; and does not bestow much attention on modern science. There is, however, great prestige connected with the College; and the Etonians, in their after-career, generally look back with affection upon it.

The chief buildings of the College consist of the chapel, the hall, the library, the schools, the provost's and master's apartments, and the lodgings of the fellows, surrounding two quadrangles; together with the boys' library and sleeping apartments, in a cluster called the New Buildings, attached to the northern side of the older group. The chapel is mostly of stone, the other buildings of brick; and the effect of the whole is very picturesque, as seen from the terrace of Windsor Castle, on the other side of the Thames. The chapel is an especially beautiful object. The houses of the masters are generally fitted up for the reception of oppidans as boarders.

ETRU'RIA, TYRRHE'NIA, TU'SCIA, designated, at a period anterior to the foundation of Rome, nearly the whole of Italy, together with some of its most important western islands. Its northern part, from the Alps to the Apennines, was known under the name of Etruria Circumpadana; its southern, from the Tiber down to the Gulf of Pæstum, or, according to some, to the Sicilian Sea, under that of Etruria Campaniana; while the central portion, bounded on the N. by the Apennines and the river Macra, S. and E. by the Tiber, and W. by the Tyrrhenian Sea, was called Etruria Propria. The two first, however, did not long remain Etruscan territory, but were either reconquered by the surrounding tribes to whom they had originally belonged, or fell into the hands of new immigrants. No historical records of that brief period of any moment having yet come to light, they do not claim our attention; while Etruria Proper, scanty though our information about it still be, deserves our interest in the highest degree. For its physical features, we refer the reader to Tuscany, Lucca, and the Transtiberine portion of the present Papal Dominions; and have only to remark, that vast expanses of that country, which now are either covered with deep forest, or are shunned on account of the malaria, were in those times fruitful, densely peopled regions. For political, or rather administrative purposes, Etruria Proper was divided into twelve sovereign cities, or rather cantons, among which the most important were Tarquinii (Corneto), the cradle of the royal family of the Tarquins, who at one time wielded the sceptre of Rome; Cære (Agylla, Cervetri), which, during the war of Rome with the Gauls, offered a refuge to the Roman Flamen Quirinalis and Vestal Virgins; Veii, the greatest and most powerful city of Etruria, with 100,000 inhabitants, which carried on seven wars with Rome; Clusium (Kamars, Chiusi), the chief of which, Porsena, as principal commander of the Etruscan troops, dictated a humiliating peace to Rome after she had expelled the Tarquins; Perusia (Perugia), destroyed in the Perusian civil war (40); Arretium (Arezzo), birthplace of Mæcenas. Of other not sovereign places may be mentioned Luca (Lucca), Pisæ (Pisa), on the Arnus, with the Portus Pisanus, now Leghorn, and Florentia (Firenze, Florence), on the Arnus.

To what nation the inhabitants—called Etruscans (= Exteri, strangers) or Tuscans in the Roman, Tyrrheni or Tyrseni (*Turrēnoi*, *Tursēnoi*) in the Greek, and Rasena (Tesne Rasne) in their own language—originally belonged, and what country they came from, is a question which was debated many hundred years before Christ, and is not settled yet. All the most ancient writers, save one of the most trustworthy, Dionysius of Halicarnassus, implicitly follow Herodotus, who—confounding them, perhaps, as is his wont, with the Lydian *Turrēnoi*, or inhabitants of the city of Tyrrha—pronounces them to be Lydians, although there is not the slightest similarity between these two nations, and although Xanthus, the Lydian historian, knows nothing whatever about a fabled famine of eighteen years' duration in Lydia, followed by an emigration to Italy under a Prince Tyrrhenus. Dionysius himself offers no opinion; he calls them an indigenous race—which means nothing; and it is surprising that some modern investigators should, despairing of a rational solution of the old riddle, have fallen back upon this evasive theory of 'autochthons.' Thucydides, in first mixing up the Torrhebian pirates with the Pelasgian fillibusters, gave rise to the most hopeless confusion about their very name. As to the innumerable theories and hypotheses that have been put forward since his day, we will only mention that while Ciampi and Collar hold them to be of Slavonic origin, Fréret calls them Celts; Micali, Albanese; Lami, Pfitzmaier, and Stickel, Semitics; and others variously make them Goths, Scandinavians, Basques, Assyrians, Phœnicians, Egyptians, and Armenians. The most rational and generally accepted opinion is that of Niebuhr—modified more or less by Ottfried Müller, Lanzi, Lepsius, Steub—of their being, when they first appear in history, a mixture of an eastern tribe, which had settled for a while in the Rhætian Alps (the Tyrol of to-day), and Pelasgians, whom they had found in their new Italian seats; these latter having, in their turn, since their immigration, mixed with the Umbrians, the oldest historical inhabitants of those parts. But, as we said before, this is only the most rational opinion that rose out of an ocean of wild speculation: so far from any authentic proofs having been brought forward in its support, the question stands to-day precisely where it stood when Dionysius wrote:—'The Etruscans do not resemble any people in language and manners.'

Immense as was their influence on Roman, and, in fact, on European civilisation, very little is known with respect to their political history. Chiefly cultivating the arts of peace, they still seem, long after their heroic period, to have been powerful enough to scare away any invader, and this probably is the reason why historians have so little to record of them; but their decline may be said to stand in an inverted ratio to the rise of Rome. The 7th and earlier half of the 6th c. B. C. had been the most powerful and flourishing epoch of the Etruscan state in its widest sense—which then probably had been in existence for four or five hundred years. Whether they had put their Tarquinii as governors over conquered Rome, or whether, on the contrary, the reign of this Etruscan family would denote the subjugation of Southern Etruria by Rome herself, is not quite clear; but the expulsion of the last Roman king, Tarquinius (Tarchon), called Superbus, was followed, about 507 B.C., by a war between the Etruscans, under Porsena of Clusium, and the Romans, which, although ending in a most ignominious peace, dictated within the walls of Rome, did not bring about the restoration of the Tarquinian dynasty. From the wars between Veii and Rome, which began in 486, and ended—interrupted only by an occasional armistice—395 B. C., with the destruction of Veii, dates the gradual but sure extinction of Etruria as an independent state. The Gauls advancing from the north, the Etruscans were forced to conclude a forty years' truce with their adversaries at any price; but these over, and the Romans being engaged with the Samnites, the Etruscans recommenced the hostilities more fiercely than ever. In the course of this last war, the Romans succeeded, 309 B.C., under Q. Fabius Maximus, in twice defeating them, and Fabius crossed the Ciminian forest—the frontier sacred from time immemorial; and when, 283 B.C., P. Cornelius Dolabella had beaten both them and their Gallic auxiliaries in a decisive and sanguinary battle at the Vadimonian Lake, Etruria became a Roman province; and about two hundred years later, the Lex Julia conferred upon her inhabitants, as a reward for their fidelity, the right of citizenship. Up to that time, they had succeeded in keeping up their own singularly distinct creed, customs, traditions, language—their nationality, in fact; when Sulla, 82 B. C., infuriated by the part they had taken against him, liberally bestowed great portions of their land upon his veterans; and some fifty years later, Octavianus planted his military colonies there. This wrought and completed the transformation of that mysterious conglomeration of heterogeneous races and tribes, hitherto called Etrurians, into Romans. Once more, well-nigh 2000 years after its extinction, the kingdom of Etruria (Hetruria) rose before the eyes of the world. The peace of Luneville re-created it, and conferred it on the hereditary prince, Louis of Parma; after whose death, his widow, the Infanta Louisa of Spain, administered the government for their son, Charles Louis, up to 1807, when it became a French province. From 1809, it again bore the name of the Grand Duchy of Tuscany; and to TUSCANY—which in our days forms a province of the Italian kingdom, as it did of yore—and to ITALY, we refer for its modern history.

We have spoken above of twelve cities as forming the confederacy of Etruria Proper. Similar confederacies of twelve cities were established, independently of each other, in the two other Etrurias. The cities themselves, however, cannot be fixed now in all cases. From the fact of more than twelve autonomous ones being recorded in Etruria Proper, it would appear that some among these twelve confederates, or *populi*, possessed more than one capital city, each populus, however, being limited to one representative vote in the general council. The members of the confederacy were bound to appear regularly at an annual religious assembly near the temple of Voltumna, a locality which we are as yet unable to point out. Here great fairs were held for the people; common operations of war being discussed by the *principes*, and a general-in-chief for the ensuing year elected from their number. Each city or canton, in the earlier times at least, had a king (Lucumo, Lauchme = Inspired), chosen for life, who at the same time acted as high-priest; and a hereditary nobility, which alone was eligible to the higher offices of state. Next to them, in the political and social scale, came the people, properly so called—free, not subject personally to the nobility; lowest stood a great number of clients or bondmen, probably the descendants of subjected original inhabitants. On the whole, the federal interdependence between the cities was far from close. Single cities carried on wars in which the others took no part; and when the confederacy resolved on general action, there were always some members which, for some reason or other, stood aloof. It appears from this that the Etruscan constitution was analogous to the Greek and Roman in their earliest stages: the community develops itself into a *polis* or city, chooses a head, or rather high-priest, and enters into a more or less intimate alliance with its neighbouring cities; but, beside that king of its own, recognises a common chief only in time of war.

The Etruscans were, as a people, less warlike than any of their neighbours, especially the Romans, and conspicuous is their want of anything like cavalry. Theirs was also the un-Italic custom of hiring soldiers, and their energies seem principally to have been directed to the more profitable occupations of trade and agriculture. One of the chief articles of their commerce was amber, which Germans brought from the Baltic to Etruria Circumpadana, whence it was conveyed to Greece by sea. In the western parts of the Mediterranean, they were formidable as pirates; while they were welcomed by the Carthaginians and the Greeks of Magna Græcia, as importers of indigenous products of nature and art, which they exchanged for the wealth of the East and South. That their commerce within Italy must have been very extensive, appears from the fact, that all the states of Central Italy adopted their system of coinage, based, like their tables of weights and measures, and many of their political institutions, on the duodecimal system.

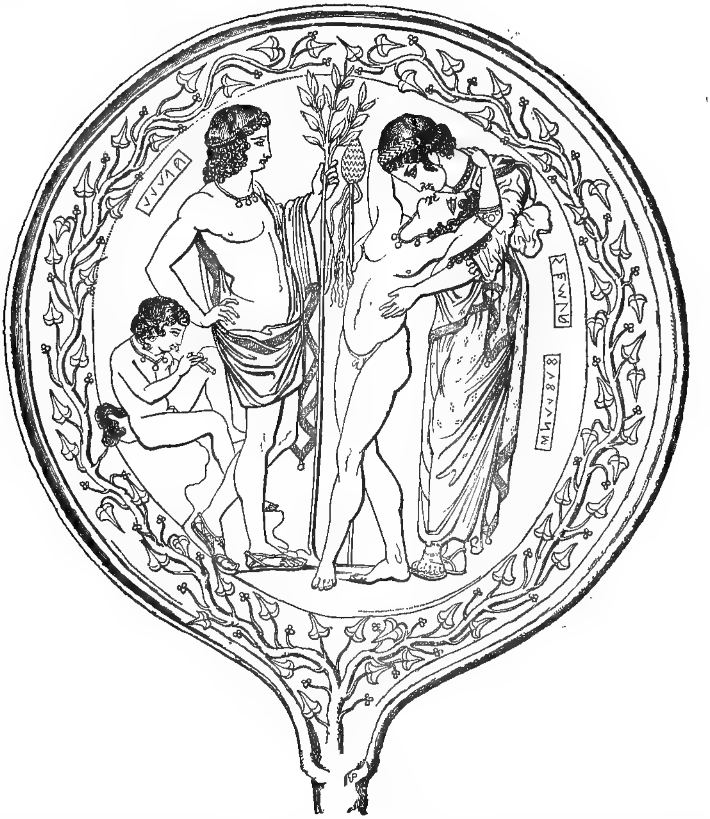
The striking contrast between the Etruscans and their Italic and Greek neighbours, which appears in the short thickset frames, the large heads and bulky extremities of the former, and the slender limbs and graceful harmony in the whole structure of the latter, and which runs with equal distinctness through the intellectual lives of the three nations, manifests itself nowhere with greater power than in their religions. Equally distant from the abstract, clear rationalism of the Latins, and the plastic joyfulness of Hellenic image-worship, the Etruscans were, as far as their dumb fragments shew—for what we find on them of human words we do not understand—chained in a dark and dotard mysticism, such as a blending of a half-forgotten Eastern symbol-service with barbarous religious practices of northern savages, grafted upon archaic Greek notions, might produce. In their Pantheon, the predominance belongs to the evil, mischievous gods; their prisoners are welcome sacrifices to the heavenly powers; they have no silent depths where the 'good spirits' of their departed dwell, but a hell of the most hideous description, and a heaven where permanent intoxication is the bliss that awaits the virtuous. They divide their gods into two classes, and they place them in the most northern, and therefore most immovable point of the world, whence they can best overlook it. The upper section is formed by shrouded, hidden gods (Involuti), of uncertain number, who act awfully and mysteriously, and twelve lower gods of both sexes, called Consentes, Complices. Tinia (Zeus, Jupiter) is the chief of these latter, and stands between the two divisions of the gods, receiving orders for destruction from the upper ones, while the lower ones form his ordinary council, and obey his behests. Nine of these (Novensiles) hurl lightnings at various times and with peculiar effects. The three of these deities which seem to have been the principal objects of worship were Tinia himself, armed with three different kinds of lightning, Cupra (Hera or Juno) and Menrfa (Minerva, Pallas Athene). Gods most peculiarly Etruscan are Vejovis, an evil Jupiter, whose thunderbolts have the power to deafen, and Nortia, the goddess of Fate, also called Lasa Mean. Besides these, they put a host of demons over the different portions of the creation:—the heavens, the earth, and the lower regions (Penates, Lares, and Manes). Their deities have generally wings; and before the Assyrian bulls had come to light, some antiquaries established from this a connection with the Hebrew winged cherubim. Characteristic in the highest degree is their 'disciplina' or art of 'divination.' This had been revealed by Tages, a grandson of Jupiter, who was dug out near Tarquinii, in the shape of a childlike dwarf with gray hair—a most striking caricature of these both childish and senile practices—and who died immediately after having communicated these mysteries. They were at first the property of the noble families; but in the course of time, as others were initiated, and schools for priests were founded, these mystical and awe-striking teachings came to be written down. It is saddening to observe here again in what monstrous insanities the spirit of man occasionally revels, and that, too, in the province of what is noblest and highest—religion. The 'disciplina' was developed into an exact science, fully as minutely and casuistically sharpening its points and splitting its hairs as Hindu or Mohammedan theology would. It taught what gods hurled the different kinds of lightning; how, by the colour and the peculiar quarter of the sky, the author of the bolt might be recognised; whether the evil denoted was a lasting or a passing one; whether the decree was irrevocable or could be postponed; how the lightning was to be coaxed down, and how it was to be buried. This was the speciality of the Fulgurales. The Haruspices had as their share the explanation of portents, prodigies, monsters, the flight and cries of birds, the entrails of sacrificial animals; while others ministered in the holy rites at the foundation of cities, the building of gates, houses, &c. Their ceremonies (a word derived from their town Cære) were endless and silly, but the show and pomp with which their priests knew how to surround these juggleries, and from which the Romans largely borrowed, made them acceptable in the eyes of the herd; and although Rome herself, with all her augurs, called Etruria 'the mother of superstition,' there was a certain odour of tithes and fees about these rites which made many anxious to 'preserve religion in its primeval purity.'

In the entire absence of anything like a genuine Etruscan account, even the outlines of the relation between their religion and that of the Greeks on the one hand, and the Romans on the other, are exceedingly difficult to trace; so much, however, is certain, that they adopted and assimilated many points of archaic Greek theology, and clothed them in a garb of their own, and that this process was gone through and repeated still more completely by the Romans, in their turn, with respect to the religious notions of the Etruscans. The articles on Greek and Roman religion will furnish further information on this point.

The high degree of civilisation which the Etruscans possessed long before Rome was heard of, is testified by innumerable works of masonry and art. The Etruscans were of an eminently practical turn of mind, and domestic, like the north. Trusting to their priests for reconciliation with the gods, who always seemed irate, but whose angry decrees could easily be foreseen and averted, they set to work in developing the inner resources of the country, and in making the best use of their intercourse with foreign countries. They thus became eminent in agriculture, navigation, military tactics, medicine, astronomy, and the like; and in all these, as well as in some of the very minutiæ of their dress and furniture, the Romans became their ready disciples and imitators. The division of the year into twelve months, of the months into kalends and nones and ides, the designation of the numerals, were Etruscan; from the same source were derived the *toga prætexta* as well as the pomp of triumphs, the *lictors* and *apparitors*, down to the ivory curule chairs. The towns of the Etruscans were clean and healthy, owing to their perfect system of drainage and sewerage; they tunnelled and excavated, they embanked and irrigated, they turned swamps into cities, changed the course of streams, and excelled in all kinds of useful public and private works. Their ideal was not the beautiful or the spiritual, but a comfortable, and, if possible, luxurious existence. As a special proof of their love for their own hearth, a quality probably imported from the north, we might adduce their invention of the atrium, the common sitting-room of the family, where the master of the house sat surrounded by his penates and the figures of his ancestors, while the wife and her handmaidens plied the labours of the loom or the distaff. As in the Germanic nations, woman stood in high estimation. She was the companion, not the slave of the husband, and thus had certainly not a little share in the softening of their primitive wildness, and in counteracting the sombreness of their creed. That we find them even in their tomb-paintings engaged in convivial carousings, dancing, races, athletic games, and that they liked their very worship accompanied by the sound of flutes, horns, and trumpets, only shews that that glorious sky of theirs, their intercourse with the nations, their wealth and culture, had gradually caused their antique and gloomy austerity to wear off, even as it wore off with the Romans and other peoples; for to assume with some that the boisterous scenes to which we allude were caused more or less by the despair arising from the loss of their independence, would be going somewhat too far. Licentiousness is the sure forerunner of the fall of a nation, but a whole people does not take refuge in enjoyment when their all is lost. We know little of Etruscan literature; it seems to have consisted mostly of rituals, religious hymns, and some historical works. Whether the Fescennines, certain mocking-songs, sung in alternate verses, with musical accompaniment, at nuptials, originated with them or not, is not decided.

We have alluded to the high proficiency of this people in architecture; they were, in fact, so renowned in this craft throughout the antique world, that, as Solomon called Phœnicians to Jerusalem to build his temple, so the Romans sought in Etruria the framers of their grandest masonic structures, such as the Cloaka Maxima, the Temple of Jupiter on the Capitol, &c. The peculiarly fantastic, and, withal, powerful mind which speaks in all their institutions, equally pervades their architectural productions; but, at the same time, everything they built, they built either for practical or pious purposes. We cannot here enter into a discussion of their manner as it appears in various epochs, but it never reached anything like a distinct national completeness, their eagerness to profit by foreign examples not allowing them to develop it to the full unalloyed. Of their walls and gates, temples and porticoes, theatres and amphitheatres, bridges and sewers, gigantic, and, in the earliest times, cyclopean—evidently erected, in Eastern fashion, by hosts of slaves—very little is extant in so complete a form as to give us an exact insight into their mode of construction; and were it not for their tombs, our knowledge would be exceedingly limited. These form one of the most peculiar features in Etruscan antiquities. Hewn in rocks, either below the ground or in the face of a cliff, they were adorned outside with a somewhat Egyptian façade of a temple or a house, which the insides themselves most exactly reproduce, with all their internal decorations, furniture, and utensils. Of the paintings which run round the walls, and which are our safest and most complete guides to the inner life of this nation, we will say more presently. We must not, in conclusion, omit to mention that their temples bore in primitive times, and always retained, in some measure, so far as we can judge, the unfinished character of the wood-buildings of northern mountain tribes—a square, half-house, half-fortification, overloaded with quaint ornamentation.

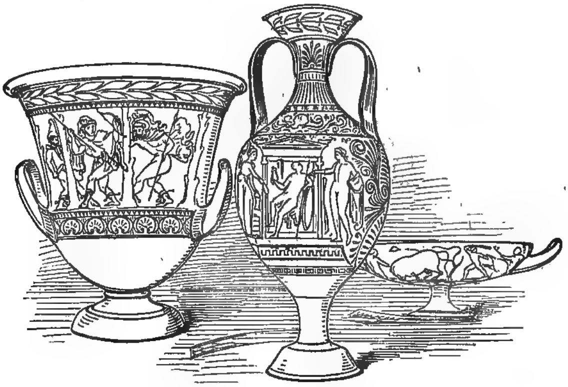
In their plastic and pictorial arts, Winckelmann has established three distinct styles—to which Dennis has added a fourth—viz., the Egyptian, with Babylonian analogies, the Etruscan or Tyrrhene proper, the Hellenic, and that of the *decadence.* Characteristic of the first style are the prevalence of straight lines, right angles, faces of an oblong, contracted oval, with a pointed chin, eyes mostly drawn upwards, the arms hanging close to the side, the legs close together, the drapery long, in straight parallel lines, the hair disposed in tiers of curls. In this style, the attitude is constrained, the action stiff and cramped. The progress shewn by the second style is the greater attention bestowed on the delineation of the muscles, which swell out in disproportionate prominences on the now almost entirely nude body. The two remaining styles explain themselves. Their statuary, as it appears chiefly on sarcophagi and cinerary urns, suggests likewise an Egyptian origin. The figures are those of their own mystical and awful Hades, instead of the Bacchic processions of Greece and Rome. The grouping follows rather a pictorial than a plastic principle; the motion is hasty and forced; but the features of the deceased, hewn on the lid, have all the rude accuracy of a spiritless portrait. Statues of deities in wood and stone have indeed been found, but very rarely. Of high renown were their ornaments and utensils in baked clay (terra cotta), in the manufacture of which objects the Veientes were especially famous. Rome, at a very early period, possessed of this material a quadriga and the statue of Summanus, made by Etruscans. Of the art of working in bronze, the Etruscans were supposed to be the inventors: that they brought it to a very high degree of perfection, is evident from the examples which remain to us. Statues and utensils were manufactured and exported in immense quantities, not only to Rome, but to every part of the known world. Of figures on a large scale still extant, we may mention the renowned She-wolf of the Capitol, the Chimæra in the Museum of Florence, the Warrior of Todi in the Etruscan Museum of the Vatican; a portrait-statue of an Orator, with the inscription Aule Meteli, in Florence; and the Boy with the Goose at Leyden. The various objects of ornament and use, found in great numbers in tombs, such as candelabra, cups, tripods, chaldrons, couches, discs; articles of armour, as helmets, cuirasses, &c.; musical instruments, fans, cists or caskets, are most of them models of exquisite finish and artistic skill. Their gems are as numerous as those of Egypt, and, like them, cut into the form of the *scarabæus* or beetle. They were exclusively intaglios, and of cornelian, sardonyx, and agate. On these the Etruscan artists represent groups from the Greek mythology, or the heroic cycle, bereft, as they seem to have been, of heroic legends of their own. They are most frequently found at Chiusi and Vulci, and were worn as charms and amulets. Special mention should be made of the metal *specula*, or mirrors, with figures scratched upon the concave side, the front or convex side being highly polished. These ranged over all the phases of Etruscan art, and are especially and peculiarly Etruscan. None but Etruscan inscriptions have ever been found upon them. They will, no doubt, prove eventually of the highest importance, not only by enabling us to follow the gradations of artistic development step by step, but by furnishing us with lists of names of gods and persons, and, it may be, of objects.



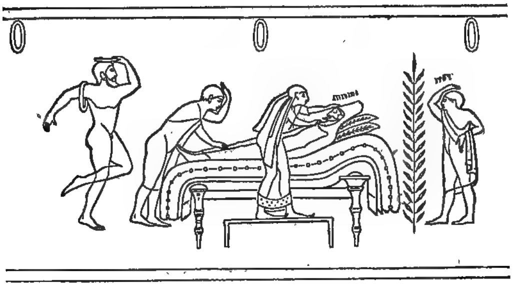
Etruscan Mirror from Vulci, with Phuphluns (Bacchus), Semla (Semele), and Apulu (Apollo).
Half size. After a drawing by Mr George Scharf.

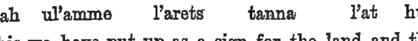
Of the vases and urns which are found in innumerable quantities in Etruscan tombs, we cannot treat here, as they are admitted on all hands to be, with very few exceptions, Greek, both in design and workmanship; we must refer the reader to the special article on VASES; but a few words may be added on the before-mentioned tomb-paintings. They are found chiefly in the cemeteries of Tarquinii and Clusium; and they are all the more important, as they lead us with minute accuracy from the very cradle of the individual, through the various scenes of his entire life, to its close; and this throughout the existence of the nation itself, beginning before the foundation of Rome, and ending in the Empire; while we follow the style in its gradual development from the Egyptian to Græco-Roman perfection. One of the annexed specimens, taken from a tomb at Corneto, represents a death-bed scene; but most of the other paintings, especially at Tarquinii, are of a very different description, as the other specimens shew. Life in its merriest aspects gleams in the most vivid of colours all round—dancing, feasting, loving, hunting. The Etruscans of later times had learned in the school of the Hellenes to dread death less, and to think of the other world as one of continued joyfulness.

We conclude with the Etruscan language. Brevity on that point will be the more pardonable, as our real knowledge of it is next to none. Scarce as the inscriptions themselves are, still one might have supposed that our days, which have seen the riddle of the cuneiform character solved, might have decided ere now whether the Etruscan be 'aboriginal' or Celtic, Slavonic or Albanese, Greek or Rhætian, Latin or Semitic, Turanic or Armenian, hieroglyphs, or any other of the languages which the different *savans* have pronounced it to be. Our present information with respect to this peculiar idiom consists in the following items:—It has twenty-one letters, like the ancient Greek, and reads from right to left. In transcribing words from other languages, it softens its gutturals and aspirates, and interchanges cognate letters, most frequently transforming *d* into *t*—for instance, Odysseus = Utage; Polydeukes = Pultuke; Adria = Hatri. The most frequent termination is *e:* Peleus becomes Pele; Tydeus, Tyde. 'Aifil' and 'Avil ril' probably mean 'he lived,' or 'he lived years,' since we find these words always followed by numerals. This question of their language is naturally identical with that of their origin, and they will both have to be settled finally together. In the meantime we may, without prejudice, say that there is something very seductive about Stickel's Semitic explanation of some of these inscriptions. We subjoin, in order to give the reader an opportunity of judging of the character itself, and also for the sake of curiosity, the first and part of the second line of a large inscription found in 1822, at Perugia, with a Hebrew transcript, and Stickel's Semitic translation. He supposes the whole to be a manifesto or solemn accusation of some expelled Rasena against the Clensi (Clusii).



Crater. Amphora. Cylix.





הוּ לְאֹת חַנְגָא לְאֶרֶץ וּלְעַמֵּי בָּהּ

bah ul'amme l'arets tanna l'at hu

'This we have put up as a sign for the land and the peoples therein.'

Of the very numerous writers who have treated on Etruria and Etruscans, we will mention Diodorus, Strabo, Dionysius, Athenæus, Cincius in his *Annals*, Cato in *Origines*, Varro in *De Lingua Latina.* Aulus Cæcina's *De Etrusca Disciplina*, as well as the Emperor Claudius' twenty books of Tyrrhenian history, are lost, but some portions of them have survived, embodied in contemporaneous and later works. In modern times, we have Dempster, *Etruria Regalis* (Florence, 1723—1724); Gori, *Museum Etruscum* (Florence, 1737—1773); Inghirami, *Monumenti Etruschi* (1821—1826); Micali, *Storia degli antichi popoli Italiani;* Ottfried Müller, *Die Etrusker* (Breslau, 1828); Micali, *Monumenti Inediti*, &c. (Rome and Paris); Dennis, *Cities and Cemeteries of Etruria* (London, 1849); Abeken, Kugler, Lenoir, Hittorf, Amaduzzi, Mommsen, Bunsen, Gerhard, &c., and the Transactions of the many archæological societies and institutes.

ETSCH. See Adigé.

ETSHMIA'DZIN, a remarkable Armenian convent in Erivan, a Transcaucasian province of Russia, and about 16 miles west of the town of Erivan. It is of great extent, is surrounded by a wall 30 feet in height, and 1½ mile in circuit. This wall encloses several distinct churches, each of which is presided over by a bishop, is cruciform in shape, and is surmounted by a kind of cupola crowned by a low spire. For many centuries, this has been the seat of the Catholicos (the head or patriarch of the Armenian Church). This patriarch presides at the synodical meetings, but cannot pass a decree without its having the approval of the moderator, an official appointed by the Russian emperor, in whose hands the control of the convent virtually rests. In the convent library there are 635 manuscripts, 462 of which are in the Armenian language.

ETTMÜLLER, Ernst Moritz Ludwig, an able writer on German antiquities, was born 5th October 1802, at Gersdorf, near Lobau, in Upper Lusatia, and studied medicine at Leipsic from 1823 to 1826, but subsequently the language and history of his native country. In 1830, having taken his degree of Ph.D. at Jena, he began to deliver lectures there on the German poets of the middle ages; but in 1833 he was called to the Zürich Academy as teacher of the German language and literature. E.'s literary activity has been exhibited chiefly in the editing of the literary remains of the Middle High-German, and older Low-German dialects. To the former belong his *Sant Oswaldes Leben* (Zürich, 1835); *Hadeloubes Lieder und Sprüche* (Zürich, 1840); *Heinrich's Von Meissen des Frouwenlobes Lieder, Leiche, und Sprüche* (Quedlinb. 1843); *Frawen Helchen Süne* (Zürich, 1846); *Heinrich's Von Veldecke Eneide* (Zürich, 1852). Of poems composed in Low German he published, among others, *Theophilus* (Quedlinb. 1849); and *Wizlâwes IV., des Fürsten Von Rügen, Lieder und Sprüche* (Quedlinb. 1852). In 1850 appeared, under his editorship, an Anglo-Saxon chrestomathy, entitled *Engla and Seaxna Scôpas and bôceras;* and in the following year his *Lexicon Anglo-Saxonicum*, which supplied a want long felt in Germany. At an earlier period in his literary career, E. paid great attention to the old Norse literature, and in this department we have from him an edition of the *Völuspâ*, &c. E. has also written poetry, as well as edited it. His *Deutsche Stammkönige* appeared at Zurich in 1844, his *Kaiser Karl d. Gr. und das Fränkische Jungfrauenheer* in 1847, and his *Karl d. Gr. und der Heilige Goar* in 1852.

ETTRICK, a pastoral vale in the south of Selkirkshire, watered by the Ettrick river, which rises amid bleak hills in the south-west corner of this county near Ettrick Pen, 2258 feet high, and runs 28 miles north-east, and falls into the Tweed. Its chief affluent is the Yarrow, which runs 25 miles from the west, through one of the loveliest of Scotch vales, and the scene of many a plaintive song. Ettrick Forest, a royal hunting tract, swarming with deer till the time of James V., included Selkirkshire and some tracts to the north. In Ettrick Vale, at Tushielaw, dwelt the celebrated freebooter or king of the Border, Adam Scot, who was summarily executed by James V. The district derives some note from two persons in modern times—Thomas Boston (q. v.), a Scottish divine, who was minister of the parish of Ettrick; and James Hogg, the Scottish poet, who, having been originally a shepherd in this part of the country, became known as 'the Ettrick Shepherd.'

ETTY, William, R.A. This distinguished artist was born at York, March 10, 1787. His father was a miller and spice-maker. Before he was twelve years of age, he was apprenticed to a printer, and served out his dreary term of seven years, the irksome drudgery of which he himself often afterwards was in the habit of narrating, occasionally soothed by dreams of, on some future day, being an artist. Freed at last, and assisted by some relatives, in 1805, at the age of 18, he entered on the study of art, and, after a year's probation, was admitted as a Royal Academy student. His career is very interesting and instructive. It exhibits one gifted with enthusiasm for art, high resolutions, and great industry and perseverance, for a series of years invariably surpassed by many of his fellow-students, and, as has been recorded, 'looked on by his companions as a worthy plodding person, with no chance of ever becoming a good painter.' Neither prizes nor medals fell to his share as a student; and for several years his pictures were rejected at the Royal Academy and British Institution Exhibitions. It was only after six years of hard study that he obtained a place for a picture in the Exhibition of the Royal Academy; and his works only began to attract notice in 1820, when the artist was 33 years of age, and as he himself has said, 'having exhibited nine years to no purpose.' But the circumstance of E.'s genius being so long unappreciated, did not so much arise from his works evincing no talent, as from his class of subjects, and those technical qualities for which his works are remarkable, not being appreciated at the time; for long before his pictures were saleable, his powers were highly appreciated by his professional brethren. On his return from Italy in 1822, where he had been studying the great Venetian colourists, he was elected an Associate of the Academy. In 1824, his *chef-d'œuvre*, 'The Combat—Woman pleading for the Vanquished,' was purchased by an artist, John Martin. In 1828, he was elected Academician by the members of the Royal Academy; while in the same year the Royal Scottish Academy testified its high appreciation of his talents by purchasing the most important of his efforts, the historical work illustrating the history of Judith and Holofernes. Testimonials so high soon had their effect; E.'s pictures came into great request, and brought large prices, and he was enabled amply to repay those who, trusting to his energies, had assisted him when he entered on the contest, in which, after so arduous a struggle, he gained so much honour. He always cherished a love and reverence for York, his native city, and had retired there some time previous to his death, which took place on November 30, 1849.

E. had an exquisite feeling for colour, which he most assiduously cultivated by studying the works of the great Venetian masters, and constantly painting from the life; and though, in his drawing, carelessness and incorrectness may often be observed, it is never vulgar, and often possesses much elevation and largeness of style. He generally chose subjects that afforded scope for colour, in which the nude and rich draperies were displayed. He executed nine pictures on a very large scale, viz.: 'The Combat;' series of three pictures illustrating the delivery of Bethulia by Judith; 'Benaiah slaying two Lion-like Men of Moab'—these five, which are the best of his large works, were purchased by the Royal Scottish Academy, and are now in the Scottish National Gallery—'The Syrens,' now in the

Manchester Institution; and three pictures illustrating the history of Joan of Arc. His smaller works are numerous. Besides his large works above referred to, he sent for exhibition to the Royal Academy and British Institution, between 1811 and 1849 inclusive, no less than 230 pictures, many of them composed of numerous figures, and all remarkable for exquisite colour. The following may be particularly noted: 'The Coral-finders;' 'Venus and her youthful Satellites arriving at the Isle of Paphos;' 'Cleopatra's Arrival in Cilicia;' a composition from the eleventh book of *Paradise Lost* ('Bevy of Fair Women'); 'The Storm;' 'Sabrina;' 'The Warrior Arming;' 'Youth at the Prow, and Pleasure at the Helm;' 'The Dance,' from Homer's description of Achilles's Shield; 'Britomart redeems Fair Amoret;' 'Dance on the Sands, and yet no Footing seen;' 'Amoret Chained.'—Compare E.'s Life by Gilchrist (Bogue, London, 1855).

ETYMO'LOGY (Gr.) is that part of grammar that treats of the derivation of words. It embraces the consideration of the elements of words, or letters and syllables, the different kinds of words, their forms, and the notions they convey; and lastly, the modes of their formation by derivation and composition. Etymological inquiries have formed a favourite pursuit from the earliest times. In the book of Genesis, numerous indications are given of the derivation of proper names. Homer also attempts etymologies of the names of gods and men, which, however, can only be looked upon as more or less ingenious fancies. The grammarians of Alexandria and Varro among the Romans tried to base their etymologies on something like principle; but the wildest conjectures continued to be indulged in, and the results were little better than guess-work down to a very recent period. As philology extended its sphere, and became acquainted with the languages and grammarians of the East, who far excelled those of the West in this particular, etymology took on a new form. It no longer sought the relations of the words of a single language exclusively within itself, but extended its view to a whole group, e. g., the Teutonic, or wider still, to a whole family, as the Indo-European, or Aryan (q. v.), and became a new science under the name of Comparative Grammar. See LANGUAGE.

Etymologicum Magnum is the name of a Greek lexicon, the oldest of the kind, professing to give the roots of the words. It appears to belong to the 10th c.; the author's name is unknown. The etymologies are mere guesses, sometimes right, often wildly absurd; but the book is valuable, as containing many traditions and notices of the meanings of old and unusual words. There is an edition by Schäfer (Leip. 1816); one by Sturz, called *Etymologicum Gudianum* (Leip. 1818); and another by Gaisford (Oxf. 1849).

EU, a tolerably well-built town of France, in the department of the Lower Seine, in Normandy, situated near the mouth of the Bresle, 93 miles north-north-west of Paris. It is remarkable for its fine Gothic church, and for the Château d'Eu, a low building of red brick, with high tent-shaped roofs of slate. E. has manufactures of sail-cloth, ropes, soap, lace, and silk. Pop. 4019. In the 11th and 12th centuries, E. was in the possession of the counts of the same name, a collateral branch of the Norman royal family. After various vicissitudes, it was purchased by Mademoiselle de Montpensier in 1675, whose fanciful taste has perpetuated itself in the architecture and decoration of the château. At a later period, it came into the possession of the Duke of Maine, from whom it passed to the Duke of Penthièvre, the maternal grandfather of Louis Philippe, who succeeded to it in 1821. Louis Philippe expended large sums on the embellishment of the château, and especially on its magnificent park and the unique portrait-gallery. It has recently acquired a new historical association through the visits of the queen of England in 1843 and 1845. The eldest son of the Duke of Nemours (born 29th April 1842) received from his royal grandfather the title of Count d'Eu. Compare Vatout, *Le Château d'Eu, Notices Historiques* (5 vols., Paris, 1836), his *Résidences Royales* (Paris, 1839).

EUBŒ'A (ancient, *Euboia;* Turkish, *Egripo;* Ital. *Negroponte*), the largest island in the Ægean Sea, forms a portion of the present kingdom of Greece. Until recently, it was called Negropont. It is bounded on the N. by the Trikeri Channel, and on the W. by those of Talanta and Egripo. It extends in a direction parallel to the mainland; is 105 English statute miles long, and 30 miles in extreme breadth, although in one part its breadth is scarcely four miles. At the narrowest part, it is connected with the mainland by a bridge. The island is intersected by a chain of mountains, running north-west and south-east, and attaining in the centre, in the range of Mount Delphi, an elevation of about 4500 feet. Copper and other metals are obtained in the island, which also contains numerous hot springs. The pastures are excellent, and the declivities of the mountains covered with forests of fir-trees. The climate is salubrious, the valleys well watered and very fertile, but little cultivated. The chief products are cotton, oil, wine, wheat, fruit, and honey. The inhabitants are chiefly engaged in the breeding of cattle; they export wool, hides, and cheese, as well as oil and grain. The chief towns are Chalcis (q. v.) on the north, and Carystos on the south coast, the latter having a population of 3000. E. was peopled in the early historic times chiefly by Ionic Greeks, and afterwards by colonists from Athens, who formed a number of independent cities or states. These were at first monarchical in their constitution, but at a later period democratic. They soon rose to power and prosperity. After the Persian wars, however, E. was subjugated by the Athenians, under whose rule it continued till they, in their turn, were subdued by Philip of Macedon. By the Romans, it was finally united with the province of Achaia under Vespasian. In 1204, it came into the possession of the Venetians, and received the name of Negroponte. In the year 1470, the island was taken by the Turks, in whose hands it remained till 1821, when the inhabitants rose to vindicate their independence at the call of the beautiful Modena Maurogenia. It now forms a portion of the modern kingdom of Greece, and has a population of 68,813.

EUCALY'PTUS, a genus of trees of the natural order *Myrtaceæ*, sub-order *Leptospermeæ*, containing a large number of species, mostly natives of Australia, and which, along with trees of nearly allied genera, form one of the most characteristic features of the vegetation of that part of the world. The genus occurs also, although much more sparingly, in the Malayan Archipelago. The trees of this genus have entire and leathery leaves, in which a notable quantity of a volatile aromatic oil is usually present. The leaves, instead of having one of their surfaces towards the sky, and the other towards the earth, are often placed with their edges in these directions, so that each side is equally exposed to the light. Many of the species abound in resinous secretions, and are therefore called GUM-TREES in Australia. Some of them attain a great size; some are found with trunks from eight to sixteen feet in diameter; a plank 148 feet in length was exhibited at the

Great Exhibition of 1851. They are of very rapid growth; and their timber, when green, is soft, so that they are easily felled, split, or sawn up; but when dry, it becomes very hard. It is used for a great variety of purposes, amongst which may be mentioned ship-building. The bark of many of the species abounds in tannin, and has become to some extent an article of commerce. Some kinds of it are said to be twice as strong as oak-bark. The bark of some is remarkable for its hardness; whilst some throw off their outer bark in longitudinal strips or ribbons, which, hanging down from their stems and branches, have a very singular appearance.—Among the resinous secretions of this genus is the substance called Botany Bay Kino, which is used in medicine as a substitute for Kino (q. v.). It is the produce of *E. resinifera*, a species with ovato-lanceolate leaves, known in Australia as the Red Gum Tree and Iron Bark Tree, a very lofty tree, attaining a height of 150—200 feet. When the bark is wounded, a red juice flows very freely, and hardens in the air into masses of irregular form, inodorous, transparent, almost black when large, but of a beautiful ruby red in small and thin fragments. Botany Bay Kino is said to consist chiefly of a peculiar principle called *Eucalyptin*, analogous to tannin. About sixty gallons of juice may sometimes be obtained from a single tree, or, in the course of a year, as much as five hundred pounds of kino.—*E. robusta*, Stringy Bark Tree, also a lofty tree, yields a most beautiful red gum, which is found filling large cavities in its stem, between the concentric circles of wood.—*E. mannifera* yields, from its leaves, an exudation resembling manna, less nauseous, and of similar medicinal properties. It contains a saccharine substance, different from *mannite*, from *glucose*, and from all previously known kinds of sugar. Another similar exudation, from the leaves of *E. dumosa*, is sometimes seen spread over large districts like snow, and used by the natives as food. Other species also yield exudations of this kind, which are described as sometimes dropping from the leaves in coagulated tears as large as an almond.—*E. Gunnii*, when wounded, yields a copious supply of a refreshing and slightly aperient liquid, which ferments and forms a kind of beer. The tree grows in Tasmania. It is not improbable that some of the *Eucalypti* of the higher parts of Tasmania may be found hardy enough for the climate of the south of England, where, indeed, some of them may already occasionally be seen in the open air.

EUCHARIST. See Lord's Supper.

EUCHLO'RINE is a very explosive green-coloured gas, possessing bleaching properties, and is prepared by heating gently a mixture of 2 parts hydrochloric acid, 2 of water, and 1 of chlorate of potash. It explodes when merely touched with a hot wire, and is most likely composed of a mixture of chlorine and chlorochloric acid $(2ClO_5,ClO_3)$.

EU'CLID, sometimes called the father of mathematics, was born at Alexandria, about 300 B.C. We know little more of his history than that he belonged to the Platonic school of philosophy, and taught mathematics in the famous school of Alexandria, during the reign of Ptolemy Soter. Though he did not create the science of mathematics, as is sometimes represented, he made prodigious advances, especially by his rigorous method and arrangement. In this respect he has perhaps never been excelled, and his *Elements of Geometry* continue to the present day to hold their place as a text-book of that science. Besides the Elements, there are extant treatises on music, optics, data, &c., ascribed to E., the authenticity of some of which is doubtful. The best editions of the whole reputed works of E. are those of David Gregory (Oxf. 1703) and Peyrard (3 vols., Par. 1814—1818). The oldest Greek edition of the Elements appeared at Basel, 1533; the best is that of August (2 vols., Berlin, 1826). Of English editions of E.'s Elements, those of Simpson and Playfair are considered the best. There is a full account of everything connected with E. and his works in Smith's *Dictionary of Greek and Roman Biography.*

EUCLID, of Megara, a Greek philosopher, has often been confounded with the mathematician of the same name. He was one of the earliest disciples of Socrates. Although Megara lay at a considerable distance from Athens, and all Megarians were forbidden to enter the Athenian territories under pain of death, E. came into the city in the evening in female disguise, to enjoy the instruction of Socrates. After the death of his master, he established a school of his own, which received the name of the Megaric School. His death took place about 424 B.C. The basis of his system was the Eleatic dogma of a one, only, universal, substance or existence. Blending with this the Socratic idea of the predominance of the moral element, E. held this one real existence to be *the good*, though it receives various names under its special manifestations.

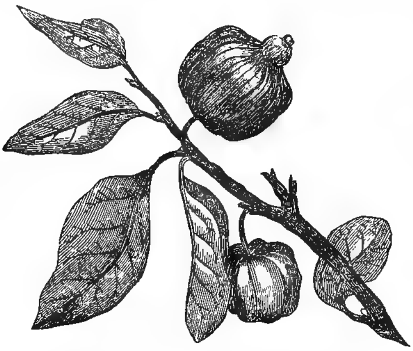
EUDIO'METER (Gr. *eudios*, good, and *metron*, measurer) is an instrument originally introduced as a measurer of the goodness of air in any locality, but which is now employed generally in the analysis of gases for the determination of the nature and proportions of the constituents of any gaseous mixture. The instrument is now made of glass in the form of a tube, which is hermetically sealed at one end, and open at the other. The tube may be straight, or bent in the shape of the letter U. In either case, the tube is graduated or marked off in equal-sized divisions from the closed end onwards, so as to admit of the volume of gas placed within being accurately measured; and two platinum wires are inserted through the glass near the shut end of the tube, and closely approach, but do not touch, each other. These wires are intended for the conveyance of electric sparks through any mixture of gases, so as to cause the combustion of certain of them. For the modes of manipulating with the eudiometer, see Gas, Analysis of.

EUDO'CIA, the name of several Byzantine princesses, of whom the most important is the wife of the Emperor Theodosius II. She was the daughter of the sophist Leontius or Leon, and was educated by her father, who instructed her in the literature of Greece and Rome, in rhetoric, geometry, arithmetic, and astronomy. Her accomplishments and her singular beauty were reckoned by Leontius a sufficient fortune, for at his death he left all his property to her two brothers. E. appealed to the emperor at Constantinople. Pulcheria, the sister of Theodosius, was interested in the maiden, and thought she would make a suitable wife for the emperor. But as E. (or, more properly, Athenais, for this was her name until her baptism) had been brought up a pagan, it was necessary first to convert her. This was easily accomplished. E. was married to the emperor in 421 A.D. For many years, however, Pulcheria ruled in the imperial household and councils, E., according to Nicephorus, 'submitting to her as mother and Augusta;' but in 447, a quarrel broke out between them in regard to the Eutychian heresy, of which E. had become a supporter. At first, E. was triumphant, and Pulcheria was banished; but in a short time the emperor was reconciled to his sister, and treated E. so sharply that she retired to Jerusalem, where she died 460—461 A.D. Her latter days were spent in works of piety and charity. She enriched churches, rebuilt the walls of the Holy City, and founded many monasteries and hospitals. Through the influence of the famous Symeon Stilites, she was induced to renounce Eutychianism, and become an orthodox Catholic Christian. E. was a poetess of considerable merit. She wrote a poem in heroic verse on the victory obtained by the troops of Theodosius over the Persians, 421 or 422 A.D.; a paraphrase of eight books of Scripture, a paraphrase of Daniel and Zechariah, and a poem in three books on the history and martyrdom of Cyprian and Justina. The authorship of *Homero-Centones* has also (but without sufficient reason) been attributed to her. This is a work composed of verses taken from Homer, and so arranged as to appear a history of the fall of man and of his redemption by Christ. It has been often published.

EUDO'XUS, of Cnidus, called by Cicero the prince of astronomers, flourished about 366 B.C. He studied under Plato for some time, and afterwards went to Egypt, where he resided for thirteen years, and had much intercourse with the Egyptian priesthood, from whom he is supposed to have derived his superior knowledge. His last years are said to have been spent on the summit of a high hill, that he might have the starry heavens ever before his eyes. There is little reason for believing that E. deserves any great admiration for his attainments in astronomy. He probably introduced the sphere into Greece, and may have corrected the length of the year, upon Egyptian information, but he appears to have been but an indifferent observer of heavenly phenomena, and Delambre considers that he was ignorant of geometry. E.'s works are entirely lost, and our only reliable sources of information regarding him are the poem of Aratus and the commentary of Hipparchus.

EUGENE, FRANÇOIS (le Prince François-Eugene de Savoie-Carignan), better known as Prince Eugene, equally distinguished as a general and as a statesman, was born at Paris, 18th October 1663. He was the son of Eugene Maurice, Count of Soissons, and of Olympia Mancini, a niece of Cardinal Mazarin. He was intended for the church; but the banishment of his mother to the Low Countries, by the orders of Louis XIV., was so deeply resented by him, that he indignantly renounced his country, and entered the service of the Emperor Leopold as a volunteer against the Turks. Subsequently, the French government made him the most flattering offers, but he never returned to the service of his native country. He displayed extraordinary military talent in the Turkish war, especially at the famous siege of Vienna in 1683, and soon rose to a high position in the army. In the Coalition War against Louis XIV. in Italy, he took an active part; and in 1691, he was raised to the command of the imperial army in Piedmont. On his return to Vienna, he was placed at the head of the army of Hungary, and defeated the Turks, with immense slaughter, in the famous battle of Zenta, September 11, 1697. The booty obtained was almost incredible, amounting to several millions sterling. In 1701 broke out the Spanish War of Succession. E. for two years commanded the army of Italy, but his forces were too small for him to accomplish anything of importance. In the year 1703, being appointed president of the council of war, he became thenceforth the prime mover of every undertaking. He first took the command of the imperial army in Germany, and along with Marlborough gained a brilliant victory at the battle of Blenheim, 13th August 1704, when the two commanders defeated the French and Bavarian army. E. afterwards saved Turin, and expelled the French from Italy in the year 1706. He shared, too, with Marlborough the glory of the fields of Oudenarde (in 1708) and Malplaquet (in 1709); but being crippled in his resources by the retirement of Holland and England from the contest, he was unable to withstand the enemy on the Rhine, and his defeat by Villars at Denain, 24th July 1712, was followed by other disasters, until the peace of Rastadt put an end to the war. In 1716, on the recommencement of the war against the Turks, E. defeated an army of 180,000 men at Peterwardein, took Temeswar, and in the year 1717, after a bloody battle, gained possession of Belgrade. After the peace of Passarowicz, which was concluded in the following year, he returned covered with glory to Vienna, where, during the succeeding years of peace, he laboured with unwearied energy in the cabinet. When the question of the succession to the throne of Poland brought on a new war with France, E. appeared again on the Rhine; but being now advanced in years, and destitute of sufficient resources, he was unable to accomplish anything of importance. After the peace, he returned to Vienna, where he died, 21st April 1736. E. was small in stature, with thin face, and long nose; he was simple in dress and manner, and indulged profusely in snuff. An enthusiast in his profession, and a strict disciplinarian, he was also kind-hearted and sympathetic, and always carefully attended to the wants of his men. He introduced no new tactics in the art of war, and was deficient in the guidance and command of masses; but by his rapidity of perception and decision, and faculty for making the best of existing circumstances, which was his *forte*, he raised the *prestige* of the Austrian arms to an eminence unequalled before or since his time. He successively served under three emperors, of whom he was wont to say, that in Leopold I. he had a father, in Joseph I. a brother, and in Charles VI. a master. E.'s political writings, published by Sartori, are important for the light they throw upon the history and manners of the time. Compare Dumont, *Histoire Militaire du Prince Eugene*; Ferrari, *De Rebus Gestis Eugenii* (Rome, 1747); Kausler, *Leben des Prinzen Eugen von Savoyen*, &c.; and Campbell's *Military History of Prince Eugene and the Duke of Marlborough.*

EUGE'NIA, a genus of plants of the natural order *Myrtaceæ*, nearly allied to *Myrtus* (see MYRTLE), and differing only in having a 4-parted instead of a 5-cleft calyx, four instead of five petals, and a 1—2-celled berry, with one seed in each cell. The species are trees and shrubs, natives chiefly of tropical and sub-tropical countries. The dried fruit of *E. Pimento* and *E. acris* forms the spice well known as allspice, Jamaica pepper, or PIMENTO (q. v.). The seeds of *E. Tabasco* are also used as a condiment. Other species yield some of the finest fruits of tropical regions, remarkable for their delicious balsamic odours. Among these is the MALAY APPLE (*E. Malaccensis*), a native of the Malayan archipelago and of the South Sea Islands, a low tree, with ovate-oblong smooth leathery leaves, and fruit in size and shape resembling a small apple, of a beautiful red colour, and with a white juicy pulp. This fruit has an agreeable odour, like that of the rose, whence it is sometimes called ROSE APPLE; a name which, on the same account, is often extended to the fruits of allied species, as *E. aquea*, and which is very often given to the JAMBOS or JAMROSADE (*E. Jambos* or *Jambosa vulgaris*), an East Indian fruit, now cultivated in all tropical countries. This fruit is pear-shaped, about the size of a hen's egg, white or red. The tree is about 20 or 30 feet high, much branched, with leaves somewhat like those of the peach, and greenish-yellow flowers in terminal bunches. *E. cauliflora*, a Brazilian species, cultivated in most of the gardens of the diamond and gold districts of the south of Brazil, yields a very fine fruit of a black colour, about the size of a greengage plum, called the Jabuticaba or Jaboticaburos. Similar fruits are produced by other Brazilian species, particularly *E. dysenterica*, *E. inocarpa*, and *E. Braziliensis*. The Bastard Guava (*E. pseudo-psidium*) and the Cayenne Cherry (*E. cotonifolia* and *E. Michelii*) produce fruits which are held in considerable esteem in the West Indies. One species only, the Ugni (*E. Ugni*), a native of Chili, appears to be sufficiently hardy for the climate of Britain; it endures at least that of the south of England: it has been recently introduced, and much extolled as a fruit shrub. Its flowers are very fragrant, and its fruit pleasant. It is much cultivated in Chili, and a very refreshing beverage, with an agreeable balsamic odour, is made of the expressed juice mixed with water. The fruit is of the size of a black currant, somewhat flattened, and of a brownish-red colour.—The bark of many species of E. is very rich in tannin. Some produce good timber.



Cayenne Cherry (*Eugenia Michelii*).

EUGENIE-MARIE DE GUZMAN, empress of the French, was born at Granada, in Spain, 5th May 1826, and is the second daughter of the Count of Montijo and of Marie Manuela Kirkpatrick. She is descended, on the father's side, from an old and noble Spanish family, which, by marriages at various times, acquired the right to assume the names of Guzman, Fernandez, Cordova, La Cerda, and Levia, and contracted alliances with the noble families of Tĕba, Banos, and Mora. By her mother—also born in Spain, and the daughter of Mr Kirkpatrick, who was for some time English consul at the Spanish seaport of Malaga—she is connected with an ancient Scottish family—the Kirkpatricks of Closeburn—which still exists, but no longer in possession of their original property. She was educated principally at Madrid, and spent a great portion of her youth in travelling with her mother, under the name of the Countess de Tĕba. In 1851, she appeared at the *fêtes d'Elysée* in Paris, where her beauty and graceful demeanour attracted the notice and excited the admiration of the emperor of the French, who married her on the 30th January 1853, at Notre Dame. On that occasion an amnesty was granted to 4312 political prisoners. The Prince Imperial, the heir to the French throne, was born 16th March 1856. In the absence of the emperor during the Italian war of 1859, she exercised the office of regent with the assistance of a council.

EUGE'NIUS is the name of four popes, of whom the last is the most important. Eugenius IV., originally called Gabriele Condulmero, was a native of Venice, and was elevated to the pontificate in March 1431. The great event in his career was the schism created in the church by the proceedings of the Council of Basel, which had been convoked by E.'s predecessor, Martin V., and had exhibited a strong tendency to ecclesiastical reform, and to limit the papal authority. E. was kept in perpetual trouble by this council, and at last, having been compelled to flee from Rome, opened a new council at Ferrara in 1438, and issued a bull of excommunication against the bishops assembled at Basel, whom he pronounced to be 'a satanic conclave, which was spreading the abomination of desolation into the bosom of the church.' The result was, that the council of Basel formally deposed him from his pontifical office in 1439, and elected in his stead Amadeus VIII., Duke of Savoy, under the title of Felix V. The conduct of France and Germany seemed to warrant this bold step, for Charles VII. had introduced into the former country the decrees of the Council of Basel, with some modifications, through the Pragmatic Sanction (1438), and the same thing happened in Germany by means of the Deed of Acceptance (1439). At the Council of Ferrara, John Paleologus II., emperor of Constantinople, and upwards of twenty Greek bishops, presented themselves, and a union between the two great divisions of Christendom—the Greek and Latin Church—was for a moment effected in July 1439. Discord, however, broke out almost immediately, and the two have ever since remained separate. E.'s rival, Felix, did not obtain much recognition, and after the death of the former at Rome, in 1447, he had to give way in favour of Nicholas V. E.'s pontificate was stormy and unhappy, and in his old age he is said to have regretted that he ever left his monastery.

EU'GUBINE TABLES (Lat. *Tabulæ Eugubinæ*), the name given to seven bronze tablets, the inscriptions on which present a comprehensive and very remarkable memorial of the Umbrian language. They were discovered in 1444 at Gubbio (the ancient Iguvium or Eugubium), where they are still preserved. The characters on four of the tablets are Umbrian, on two Latin, and on one partly Latin and partly Umbrian. The *language* employed, however, is in all cases the same, and differs both from Etruscan and Latin, but resembles somewhat the older forms of the latter, and also the Oscan dialects, so far as we know them. The subjects of the inscriptions are directions concerning sacrificial usages and forms of prayer, and they seem to have been inscribed three or four centuries before the Christian era. Philip Bonarota first published them in a complete form in Dempster's *Etruria Regalis* (2 vols., Florence, 1723—1724). The first really judicious attempt at interpretation was that of Lanzi, in his *Saggio di Lingua Etrusca* (3 vols., Rome, 1789), who points out the important fact that they related to sacrificial usages, &c. His views have been carried out by Ottfried Müller in his work *Die Etrusker;* Lepsius, *De Tabulis Eugubinis*, &c. The most accurate copy of the inscriptions is that given by Lepsius in his *Inscriptiones Umbricæ et Oscæ* (Leip. 1841); the best and most complete work on the language and contents of the tablets is that of Aufrecht and Kirchhoff, entitled *Die Umbrischen Sprach. Denkmäler* (2 vols., Berlin, 1849—1851).

EU'LER, Leonard, one of the greatest of mathematicians, was born at Basel, April 15, 1707, and received his first instructions in the science, for which he afterwards did so much, from his father, who was pastor of the neighbouring village of Riechen. At the university of Basel, he studied under John Bernouilli, and was the friend of Daniel and Nicholas Bernouilli. At the age of 19, he was second in the contest for a prize offered by the Academy of Paris for the best treatise on the masting of ships. His friends, the Bernouillis, had been called to St Petersburg by Catharine I., when she founded the Academy, and they now induced E. to settle in that capital, in 1730, as Professor of Physics. Three years later, he exchanged his professorship for a place in the Academy. From that time, he continued to labour in the field of mathematics with an ardour really astonishing. More than half the mathematical treatises in the 46 quarto volumes published by the St Petersburg Academy from 1727 to 1783 are by E., and at his death he left more than 200 treatises in MS., which were afterwards published by the Academy. The Paris Academy of Science awarded him the prize on ten several occasions, one of which was his treatise on Tides, 1740. In 1741, he accepted the invitation of Frederick the Great to Berlin. He afterwards, 1766, returned to St Petersburg, where he was made director of the mathematical department of the Academy, and died September 7, 1783. The last years of his life were spent in total blindness.

E. was of an amiable and religious character, always cheerful and good humoured; in society, he was distinguished for his agreeable wit. It was doubtless his residence in St Petersburg that led him to the application of mathematics to the building and management of ships, as embodied in his *Théorie de la Construction et de la Manœuvre des Vaisseaux* (Petersb. 1773). The great problems left by Newton to his successors were the objects of his unceasing research. On physical subjects, E. often adopted extremely untenable hypotheses. He occupied himself also with philosophy in the proper sense of the word. He undertook to prove the immateriality of the soul, and to defend revelation against freethinkers. In his *Lettres à une Princesse d'Allemagne sur quelques Sujets de Physique et de Philosophie* (3 vols., Berl. 1768; new ed., Par. 1812; and which have also been translated into English), he attacked Leibnitz's system of monads and of a pre-established harmony. But this was not the field in which he was best calculated to shine; his proper domain was the abstruser parts of pure mathematics. His most important works of this class are his *Theory of Planetary Motion*, *Introduction to the Analysis of Infinites*, *Institutions of the Differential and of the Integral Calculus*, and *Dioptrics*, which are all, as well as his *Opuscula Analytica*, in Latin. His *Introduction to Algebra* is well known.

EUME'NIDÉS (literally, the well-minded or benign goddesses) was the euphemistic name of certain fearful beings, whose true name of Erinnyes (from *erino*, I hunt up, or *erinuo*, I am angry) it was considered unlawful to utter. Their Latin name was *Furiæ* or *Diræ*. We find them mentioned by the earliest poets, and they play a prominent part in the writings of the tragedians, where their sphere of action is much extended. In the earliest times, Homer and Hesiod represent them as avenging and punishing perjury and murder, as also the violation of filial duty and of the rite of hospitality; they were also regarded as goddesses of Fate (like the Parcæ), and had a share in the grim Providence which led the doomed ones into the way of calamity. A part of their function was also to hinder man from acquiring too much knowledge of the future. In these poets, their number is sometimes undefined; sometimes they appear as one. The limitation to the number three, as well as their names Alecto, Megæra, and Tisiphone, is of a later period, a whole chorus of Erinnyes appearing in the writings of Æschylus. According to Homer, they dwelt in Erebus, and with this the duration after death of the punishments which they inflict is connected. Hesiod calls them the daughters of Ge and Uranus. Æschylus describes them as having the features of gorgons and harpies, their bodies covered with black, serpents twined in their hair, and blood dripping from their eyes. The later poets and sculptors represented them in the more pleasing form of winged virgins, attired in the garb of huntresses, bearing torches in their hands, and with a wreath of serpents round their heads. Gradually, they came to be considered goddesses of the infernal regions, who punished crimes after death, but seldom appeared on earth. In Athens, their worship, which, like that of the other infernal deities, was conducted in silence, was held in great honour. The sacrifices offered to them were black sheep and libations of *nephalia*—i. e., honey mixed with water. The turtle-dove and the narcissus were sacred to them. They had a sanctuary in the vicinity of the Areopagus, and one at Colonus.

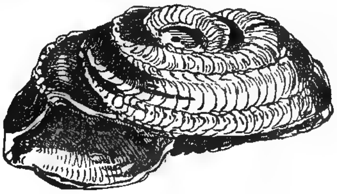
EUMO'LPUS (the 'sweet singer') was, in the later mythology of Greece, the son of Poseidon and Chione. He was brought up in Ethiopia, whence he went to Thrace, and afterwards passed into Attica, at the head of a body of Thracians, to assist the Eleusinians in their war against Erechtheus, king of Athens. E. and his sons are said to have been slain in battle. He is spoken of as the founder of the Eleusinian mysteries. A distinction is made by some of the ancient writers between this E. and a son of Musæus bearing the same name. The latter is represented as a scholar of Orpheus, and the instructor of Hercules; but E.'s history, like all mythological stories, is involved in great obscurity and confusion. The name of E. is one of the series of those old priestly singers who, by the institution of religious ceremonies, spread culture and morality among the rude inhabitants of Hellas. An illustrious Athenian family, the *Eumolpidæ*, derived their descent from E., and held the office of priests of Demeter in Eleusis.

EUNO'MIUS, the founder of the Arian sect of Eunomians, was born in the village of Dacora, in Cappadocia, and was first a lawyer, then a soldier, and ultimately took holy orders. In 360, he was appointed Bishop of Cyzicum. In the great controversy regarding the nature of the Trinity which raged during the 4th c., E. was conspicuous by his advocacy of the view that the Father alone was eternal and supreme; that the Son was generated of Him; and the Holy Spirit, again, of the Son. His doctrine of the Trinity is sometimes called the *Anomoian* ('dissimilar'), to distinguish it, on the one hand, from the *Homoiousian* ('similar'), held by the semi-Arians, and, on the other, from the *Homoousian* ('identical'), held by the Athanasian or Trinitarian party. It was thus the extreme of Arianism. In defence of his peculiar views, E. is said to have shewn superior ability, although his opponents also accuse him of being verbose and inflated in his style. His life was much chequered. He was banished from one place to another, until at length he obtained permission to retire to his native village, where he died in 394. His writings have entirely perished, with the exception of a fragment here and there preserved in the writings of his adversaries.

EU'NUCH. The original signification of this word (Gr. *eunuchos*, one who has charge of a bed) points to the office that this class of persons fulfilled, and still fulfil in the East—that, namely, of taking charge of the women's apartments or harems.

The barbarous practice of employing castrated males as guardians of the other sex, is an accompaniment of polygamy, and is therefore chiefly met with in the East and in North Africa. If it has appeared in countries where monogamy was the law, it was in consequence of the introduction of Oriental luxury, as was the case under the Roman emperors. The practice is of great antiquity, and seems to have originated in Libya, and from that to have spread to Egypt and the East. Syria and Asia Minor were the most notorious in this respect. In Greece, it never obtained any great footing; for although Greek women were kept in seclusion, polygamy itself never prevailed. The later Romans kept eunuchs, but they were mostly imported. In the Byzantine empire, on the contrary, castration and keeping of eunuchs were very prevalent. This class played a prominent part in the court of the Eastern Empire, and the word eunuch came to be the title of an office similar to that of chamberlain. In modern times, the practice is mostly confined to Mohammedan countries, and the eunuchs are chiefly brought as slaves from the interior of Africa.

EUO'MPHALUS, a large genus of fossil gasteropodous shells, characterised by its depressed and discoidal shell, with angled or coronated whorls, five-sided mouth, and very large umbilicus. The operculum was shelly, round, and multi-spiral. The genus seems related to *Trochus*. It appears among the earliest tenants of the globe, and keeps its place till the Triassic period. No less than eighty species have been described. Our figure represents one from the Wenlock limestone.



Euomphalus Discors.

EUONYMUS. See Spindle Tree.

EUPATO'RIA (formerly *Koslov*), a thriving maritime town of Russia, in the government of Taurida, is situated on a bay in the west coast of the Crimea, 15 miles north-west of Old Fort, and 38 miles north-west of Simferopol. The town stands on the border of a monotonous pastoral steppe, and is surrounded by low hills. Seen from the sea, it presents, with its occasional minarets and its houses roofed with red tiles, a somewhat picturesque appearance. The principal building is the Tartar mosque, built by Devlet-Ghiri Khan in 1552, and reckoned the finest in the Crimea. E. exports corn, wool, and salt. Its harbour is shallow, and is sheltered only from the north and north-east winds. Pop. 13,340, mostly Crim-Tartars and Jews, who are engaged chiefly as farmers and shepherds, and possess an immense number of oxen and sheep, and a large area of badly cultivated land.

On the 14th September 1854, a portion of the Anglo-French invading army landed here, and occupied and fortified the town. It was also the scene of a battle between the Russians and Turks, 17th February 1855, in which the latter were victorious.

EUPATO'RIUM, a genus of plants of the natural order *Compositæ*, sub-order *Corymbiferæ*, having small flowers (heads of flowers) in corymbs, florets all tubular and hermaphrodite, club-shaped stigmas, imbricated bracts, a naked receptacle, and a hairy pappus. The species are numerous, and mostly American. One only is British, the common Hemp Agrimony (*E. cannabinum*), a slightly aromatic perennial plant, growing mostly in marshy places, and on the banks of streams. The root was formerly employed as a purgative, and the plant was also used as a diuretic and as a vulnerary.—Thorough-wort (*E. perfoliatum*), a species having the opposite leaves joined at the base, is very common in low grounds in North America, and is a popular medicine, much esteemed and used in that country. It is often administered in intermittent fevers. It acts powerfully as a sudorific, and is often very beneficial in catarrh and influenza. It is also emetic and purgative, and, in small doses, tonic. The whole plant is very bitter.—Other North American species possess similar properties, and the root of one, known as Gravel-root (*E. purpureum*), is employed as a diuretic for relief of the disease from which it derives its name.—The Ayapana (*E. Ayapana*), a half-shrubby species, native of the north of Brazil, has a high reputation in that country as a cure for snake-bites, and has been introduced into the East Indies. It is a very powerful sudorific, and is also diuretic.—The famous Peruvian vulnerary, Matico, has been referred, but uncertainly, to a shrubby species of this genus, *E. glutinosum*.—Guaco or Huaco, much valued in Peru as a cure for snake-bites, is supposed to belong to the allied genus *Mikania*.

Hemp Agrimony (*Eupatorium cannabinum*).

a, a floret.

EU'PEN, a flourishing manufacturing town of Rhenish Prussia, is situated in a beautiful valley on the Weeze, within 2 miles of the Belgian frontier, and 9 miles south-south-west of Aix-la-Chapelle. It is well built and open, including within its limits several gardens and meadows. E. has the most flourishing woollen manufactures of any town in Prussia—containing no less than 14 woollen mills, working nearly 1000 looms, and giving employment to between 3000 and 4000 persons. E. has also dye-works, machine-making, and other manufactures. It owes the prosperity of its manufactures chiefly to a number of French refugees, who settled here after the peace of Lunéville. Pop. 12,789.

EU'PHEMISM (Gr. *eu*, well, and *phemi*, I speak) is a figure of rhetoric by which an unpleasant or offensive matter is designated in indirect and milder terms. Thus, instead of directly calling up an unpleasant image by the word *died*, we say, 'he was gathered to his fathers.' The ancients used a multitude of euphemisms, to avoid words that were thought to be ominous of evil, or offensive to the unseen powers. They spoke, for example, of the Eumenides, or 'benign goddesses,' instead of the Furies; just as the elves and fairies of modern superstition are spoken of as 'good neighbours.'

EU'PHON, or **EU'PHONON**, a musical instrument invented by Chladni in 1790. It is similar in tone to the harmonica, and, like it, the tone is produced from the sounding body by the finger direct, without mechanism, and is regulated in quality and effect by the taste and feelings of the performer, who can produce tones from the most delicate pianissimo to fortissimo. In 1822, Chladni exhibited an improved euphon, of which a detailed description is given by himself in the Leipsic *Musik-zeitung* of that year, page 805.

EUPHO'RBIA, Oil of, or **OIL OF CAPER SPURGE**, an extremely acrid fixed oil, obtained by expression, or by the aid of alcohol or ether, from the seeds of the Caper Spurge (*Euphorbia Lathyris*), a plant common in many parts of Europe, and naturalised in some places in Britain. See Spurge. Oil of euphorbia has much resemblance to croton oil in its properties, although less powerful, and is sometimes used as a substitute for it, in doses of from three to ten drops. It is good for use only when recently extracted.

Caper Spurge (*Euphorbia Lathyris*).

EUPHORBIA'CEÆ, a very extensive natural order of exogenous plants, containing upwards of 2500 known species—trees, shrubs, and herbaceous plants. They abound chiefly in warm countries, and most of all in tropical America. The few species found in the colder parts of the world are all herbaceous. The common Box reaches a more northern limit than any other shrubby species. The other British species are different kinds of Spurge (*Euphorbia*) and Dog's Mercury (*Mercurialis*). The E. usually abound in an acrid and poisonous milky juice; although there are species of which the juice is bland or becomes bland through the application of heat, so that their leaves may be used as food. The leaves in this order exhibit great diversities. The inflorescence is also various. Amongst those most remarkable for the acridity of their juice are the Manchineel (q. v.) and *Excœcaria agallocha*, an East Indian tree—formerly supposed to yield one of the kinds of aloes-wood—the smoke from the burning of which is extremely dangerous to the eyes. The juice of many of the spurges is also very acrid. Many of the E. are valued for their medicinal properties, different parts of the plant being in some instances employed, and in some the resins and oils which they yield. Thus the juice of some of the spurges, the roots or bark of the roots of others, the bark of different species of *Croton* (Cascarilla Bark, Copalche Bark), &c., are used in medicine; and to plants of this order we are indebted for euphorbium, oil of euphorbia, castor oil, croton oil, &c. A few of the E. yield balsamic products of exquisite fragrance (see Croton); a few, although their juice is poisonous, yield a wholesome starch in considerable abundance (see Manioc); a few are cultivated and used as pot-herbs, particularly species of *Plukenetia* in the East Indies; a few yield wholesome and agreeable sub-acid fruits, as *Cicca disticha* and *C. racemosa* in the East Indies; the seeds of some are eatable, as those of the Candle-nut (q. v.), of *Omphalea diandra*, a Jamaica tree, and of *Conceveiba Guianensis*, the latter being esteemed particularly delicious; the oil of the seeds is also in some cases used for food, like other bland oils (see Candle-nut); but more frequently it is used for burning, as castor oil, candle-nut oil, the oil of *Elæococca verrucosa* in Japan and Mauritius, and the concrete oil of *Stillingia sebifera*, which is used in China for making candles, and in medical preparations as a substitute for lard.—The dye-stuff called Turnsole (q. v.) is obtained from a plant of this order; and a bright red is imparted to silk by the roots of *Rottlera tinctoria*, a native of Circassia, and by a red powder with which its seed-vessels are covered. The timber of some of the E. is valuable. African Teak (q. v.) belongs to this order. The red-coloured wood of *Stylodiscus trifoliatus* is used in Java for making masts. Some of the E. are often cultivated in gardens and hothouses, more frequently for their curious appearance than for their beauty; but the large deep crimson bracts of *Poinsettia pulcherrima*, a native of Madagascar, make it a very attractive plant.

EUPHO'RBIUM, an extremely acrid gum resin, obtained from several species of *Euphorbia* or Spurge (q. v.), as *E. officinarum* and *E. antiquorum*, in the north of Africa, Arabia, and the East Indies, and *E. Canariensis* in the Canary Islands. It is obtained by incisions in the branches, whence issues a corrosive milky juice, which dries in the sun, and becomes a yellowish-gray waxy gum resin. The persons who collect it are obliged to defend their mouths and nostrils by a cloth, as its particles produce incessant sneezing, violent inflammation of the nostrils, and a very painful burning sensation in the mouth. On account of its excessive acridity, it is now less used in medicine than formerly; although it is still occasionally mixed with Burgundy pitch or other substances to make rubifacient plasters for chronic affections of the joints; its alcoholic tincture is used as a caustic in carious ulcers, and its powder, mixed with much starch or flour, as an *errhine* in chronic affections of the eyes, ears, or brain. It was formerly administered as an emetic and drastic purgative, but is dangerously violent in its action.

EUPHRASIA. See Eyebright.

EUPHRA'TES (in the Oriental languages, *Frat*, *Phrat*, or *Forat*) is the largest river in Western Asia, and, with the Tigris, forms the most important river-system of that quarter of the world. It has its source in the heart of Armenia in two branches—the Kara Su and the Murad, of which the former rises 25 miles north-east of the town of Erzerum, and flows south-west to a point 10 miles north of Keban' Ma'den, where it is met by the Murad, which rises on the southern slope of Alá Tagh, and flows west-south-west to the point of confluence. From Keban' Ma'den, the E. flows in a general southern direction, with a tendency, however, to struggle westward towards the Mediterranean. In this part of its course, it breaks through the Taurus, and flows among the mountains for 45 miles, emerging at Sumeisat, whence it continues navigable to the sea—a distance of 1195 miles—and passing Bir, at which point it is 628 feet above the level of the Mediterranean, and 100 miles distant from its nearest shore. After passing Samosta, it changes its direction, and flowing south, separates for a considerable distance Mesopotamia from Syria and the deserts of Syrian Arabia. Curving to the south-east, it flows on without receiving almost any tributaries for about 700 miles, until it is joined at Kurnah or Kornah by the waters of the Tigris. From Kurnah, the river, taking the name of the Shatt-el-Arab, continues to flow in a south-east direction, until, after being united by a canal with the Karun from the mountains of Persia, it empties itself, by several arms, into the Persian Gulf, 90 miles below Kurnah. The total length of the E. is 1600 miles; the area drained by all the waters which enter the Persian Gulf by the Shatt-el-Arab, is 108,000 miles; and the volume of water discharged by it is 401,010 cubic feet per second, or 72,910 cubic feet more than that discharged by the Danube in the same time. The average width of the Shatt-el-Arab is upwards of 600 feet; it is navigable in mid-stream for vessels of 500 tons.

The water of the E., although muddy, is not unwholesome. Its inundations, caused by the melting of the snows, take place chiefly from the beginning of March till the end of May; and in ancient times, when canals and embankments regulated these inundations, exercised the same beneficial effect on the country as those of the Nile on Egypt. See BABYLONIA.

EUPHROSYNE (i. e., the joyous one), one of the Graces (q. v.).

EU'PHUISM (Gr. *euphues*, of vigorous growth; eloquent), a term used in English literature to denote an affected and bombastic style of language, fashionable for a short period at the court of Queen Elizabeth. The word was formed from the title of the book which brought the style into vogue, the *Euphues* of John Lyly (q. v.).

EU'PIONE (Gr. *eu*, good, and *pion*, oil) is an extremely mobile oil, obtained from the lighter portions of the liquid products of the destructive distillation of wood (wood-tar), coal (coal-tar), and animal matter, and in the distillation of rape-seed oil. It may be obtained in a sufficient state of purity by acting upon the crude tars and oils by concentrated sulphuric acid, or a mixture of sulphuric acid and nitre, which removes the majority of the other ingredients; and on the distillation of the portion which resisted the action of the acid, the first part which passes over is the eupione. When pure, it has the composition C_5H_6, and is therefore a hydro-carbon. It is the lightest liquid known, having the density of 655 (water = 1000), and is thin, colourless, and tasteless, whilst it possesses a pleasant aromatic odour. It boils at 116° F., and distils readily; whilst, when set fire to, it is very inflammable, burning with a white flame of considerable luminosity and penetrating power. It makes a greasy stain on paper, is insoluble in water, very slightly soluble in alcohol, but readily miscible with ethers and oils in general.

EU'PODA, a family of coleopterous insects of the tetramerous section of the order, deriving their name (Gr. well-footed) from the great size of the hinder thighs of many of the species. They feed on the stems and leaves of plants, some of them on aquatic plants, the roots of which afford food to their larvæ. The body is oblong; the antennæ filiform. Some of the eupoda are among the most splendid of tropical insects. Britain produces a number of small species.

EURE, a department in the north-west of France, immediately south of the department of Seine Inférieure, contains an area of 2262 square miles, and 404,665 inhabitants. Its surface is unusually level, as the highest eminences in the department are not more than 300 feet in height. The principal river is the Seine, which entering the department from the south-east, flows through it in a north-west direction to Pont de l'Arche, below which the course of this river is in the department of Seine Inférieure. The Eure, from which this department derives its name, and the Rille, both affluents to the Seine, are the only other important rivers. The climate is mild, moist, and foggy. Great part of the level country is covered with a loamy alluvial soil upon a stratum of limestone; while the remainder is composed of chalk, flint, and tufa. Along the Seine, the soil is in some parts sandy, stony, and barren, but the greater part is very fertile. The chief natural products are corn, hemp, flax, vegetables, and fruit, particularly apples and pears, from which large quantities of cider and perry are made. The breeding of cattle, horses, and sheep, is favoured by extensive meadows and pasture-lands. Iron is found in considerable quantities. There are extensive iron and copper works and pin manufactories. Cotton goods, cloth, linen, paper, glass and stoneware are likewise manufactured. The department of Eure is divided into five arrondissements—Evreux, Louviers, Les Andelys, Bernay, and Pont-Audemer. The capital is Evreux (q. v.).

EURE, a river of the north-west of France, and a tributary of the Seine, rises in the department of Orne, flows first south-east into the centre of the department of Eure-et-Loir, then north and north-west through the departments of Eure-et-Loir and Eure, and joins the Seine on the left above Pont-de-l'Arche, after a course of about 100 miles. Only that portion of the E. which is in the department of Eure is navigable.

EURE-ET-LOIR, a department of France, formed chiefly from the province of Orléannais, extends between lat. 47° 57′—48° 55′ N., and long. 0° 47′—2° E. Area, 2248 square miles. Pop. 291,074. It is watered mainly by the Eure in the north, and the Loir in the south, the two rivers from which it takes its name. This department lies on the water-shed between the Bay of Biscay and the English Channel. It is in general level, the east and south being occupied by high and extensive flats; while in the west, the scenery is finely varied by hill and valley. The soil is fertile, and, especially toward the east and south, is admirably adapted for wheat. Hops grow spontaneously in some quarters. In the forests, the oak and birch are the prevailing trees. The rivers, none of which are navigable in this department, furnish valuable water-power for the numerous mills of various kinds that are situated on their banks.

Iron is the only mineral found and worked to any great extent; but the chief articles of trade are corn, flour, and wool. The department is divided into the four arrondissements of Chartres, Château-Dun, Dreux, and Nogent-le-Rotrou, with the town of Chartres for capital.

EURI'PIDÉS, the latest of the three great Greek tragedians, was born at Salamis, 480 B.C., on the very day (23d September), it is said, of the glorious victory gained by the Greeks over the Persians near that island. The Arundel Marble, however, gives as the date of his birth 485 B. C., while Müller, following Eratosthenes, makes it four years later. His education was very good. At first, he was trained to gymnastic exercises (in consequence of the prediction of an oracle that he should be crowned with 'sacred garlands'); he next turned his attention to painting; then studied philosophy under Anaxagoras, and rhetoric under Prodicus, and formed a lasting friendship with Socrates. The first play of E.'s which was performed was the *Peliades* (456 B. C.). In 441 B. C., he gained the first prize for tragedy, and continued to write for the Athenian stage until 408 B. C., when he accepted an invitation to the court of Archelaus, king of Macedonia. Scandal has invented other reasons for E.'s leaving Athens, but they are unworthy of notice. He is said to have been killed (406 B. C.) by dogs, which were set upon him by two brother-poets who envied him his reputation. In E.'s time, Greek tragedy had been brought to its highest perfection by Sophocles, who was fifteen years older than Euripides. The latter, however, was the second favourite author of his time; nay, on more than one occasion, his tragedies were preferred to those of Sophocles; but his liberal and even neologistic tendencies in regard to religion, excited the hostility of that witty but scurrilous champion of Greek orthodoxy Aristophanes, who frequently ridiculed E. in cutting parodies. There can be no doubt that E. was systematically abused by the Athenian Tory party, of whom Aristophanes was the literary chief, and to whose unscrupulous opposition it was owing that he gained the prize only five times out of 75 competitions. But against the censure of Aristophanes, may be set the praise of two much greater men—Aristotle and John Milton. E.'s plays are reckoned by some to have amounted to 75, by others to 92. Only 18 have come down to us. These are—*Alcestis* (438 B. C.), *Medea* (431 B. C.), *Hippolytus* (428 B. C.), *Hecuba* (424 B. C.), *Heracleidæ* (421 B. C.?), *Supplices* (421 B. C.?), *Ion* (date not ascertainable), *Hercules Furens* (date not ascertainable), *Andromache* (420—417 B. C.), *Troades* (415 B. C.), *Electra* (415—413 B. C.), *Helena* (412 B. C.), *Iphigeneia in Tauris* (date uncertain), *Orestes* (408 B. C.), *Phœnissæ* (probably same year), *Bacchæ* (probably written in Macedonia), *Iphigeneia in Aulis* (posthumously represented in Athens); and finally, *Cyclops* (uncertain). *Rhesus*, attributed to E., is probably not genuine. Concerning E., and his tragedies, A. W. Schlegel remarks: 'Of few authors can so much good and evil be predicated with equal truth. He was a man of infinite talent, skilled in the most varied intellectual arts; but although abounding in brilliant and amiable qualities, he wanted the sublime earnestness and artistic skill which we admire in Æschylus and Sophocles. He aspires only to please, no matter by what means. For this reason, he is so frequently unequal to himself; producing at times passages of exquisite beauty, and frequently sinking into positive vulgarity.' The main object of E. was to excite emotion, and his works laid open a totally new world (in literature), that of the heart, which, beyond dispute, contributed much to their popularity. On the other hand, his inartistic and careless plots compelling him to a constant use of the *Deus ex machinâ* solution of difficulties, and occasionally even the subjects of his art themselves, leave ample room for criticism. Archelaus refused to allow his bones to be removed to Athens, and erected a splendid monument to him in Pella, with the inscription: 'Never, O Euripides, will thy memory be forgotten!' Still more honourable was the inscription on the cenotaph erected to him by the Athenians on the way to the Piræus: 'All Greece is the monument of Euripides; Macedonian earth covers but his bones.' Sophocles, who survived him, publicly lamented his loss; and the orator Lycurgus afterwards erected a statue to him in the theatre at Athens. The *editio princeps of E.* appeared, it is thought, at Florence, toward the end of the 15th century. The best modern editions are those of Beck (Leip. 1778—1788), Matthiae (Leip. 1813—1829), and the Glasgow edition of 1821. An English translation in verse, by Potter, appeared at Oxford in 1814.

EU'ROPE, the smallest, but also the most highly civilised and most populous of the three great divisions of the old continent. It is separated from America on the west and north-west by the Atlantic; from Africa on the south by the Mediterranean; and from Asia by the Archipelago, Sea of Marmora, Black Sea, Caucasian ridge, Caspian Sea, Ural River and Mountains, and the Kara River. It is in the form of a huge peninsula, projecting from the north-west of Asia. Its extent from Cape St Vincent on the south-west to the mouth of the Kara River on the north-east is 3400 miles; and from Cape Nordkun, the most northerly point of the Scandinavian mainland, to Cape Matapan, the southmost point of Greece, 2400 miles. The continent of E., irrespective of islands, lies within lat. 36° 1′—71° 6′ N., and long. 9° 30′ W.—68° 30′ E. Its area is estimated at nearly 3,800,000 square miles; and its coast-line, more extensive in proportion to its size than that of any other great natural division of the globe, is estimated at 19,500 miles; giving a proportion of 1 linear mile of coast for every 190 square miles of surface. It has a population of 282,000,000, which gives an average of about 75 for every square mile.

The body of the European continent divides itself naturally into two great portions—the great plain in the north-east, and the Highlands in the south-west, the mountainous peninsula of Scandinavia, lying, as it were, apart from either, being to some extent exceptional. The plain occupies about two-thirds (2,500,000 square miles) of the entire extent of the continent. It reaches from the eastern boundary of E., north to the shores of the Arctic Ocean, south to Mount Caucasus and the Black Sea, and westward over the whole extent of the continent; gradually, however, becoming narrower in its progress west. In shape, this plain resembles a triangle; its base rests on the eastern boundary, and it may be said to reach its apex on the shores of Holland. It separates the two mountain systems of E.—the Scandinavian system (see Dofrines, Scandinavia) on the north, and on the south the system of Southern Europe. See Alps, Apennines, Balkan, Carpathian Mountains, Cevennes, Pyrenees, &c.

Jutting out in numerous peninsulas, and indented by extensive bays and gulfs, E. has no town at a much greater distance from the sea than 400 miles, save those in the centre of the eastern plain; but even here, by means of numberless rivers and the canals, which, from the nature of the country, are easily constructed and maintained, a splendid system of communication by water now exists. See Volga, Düna, Dnieper, Niemen, &c.; also Russia.

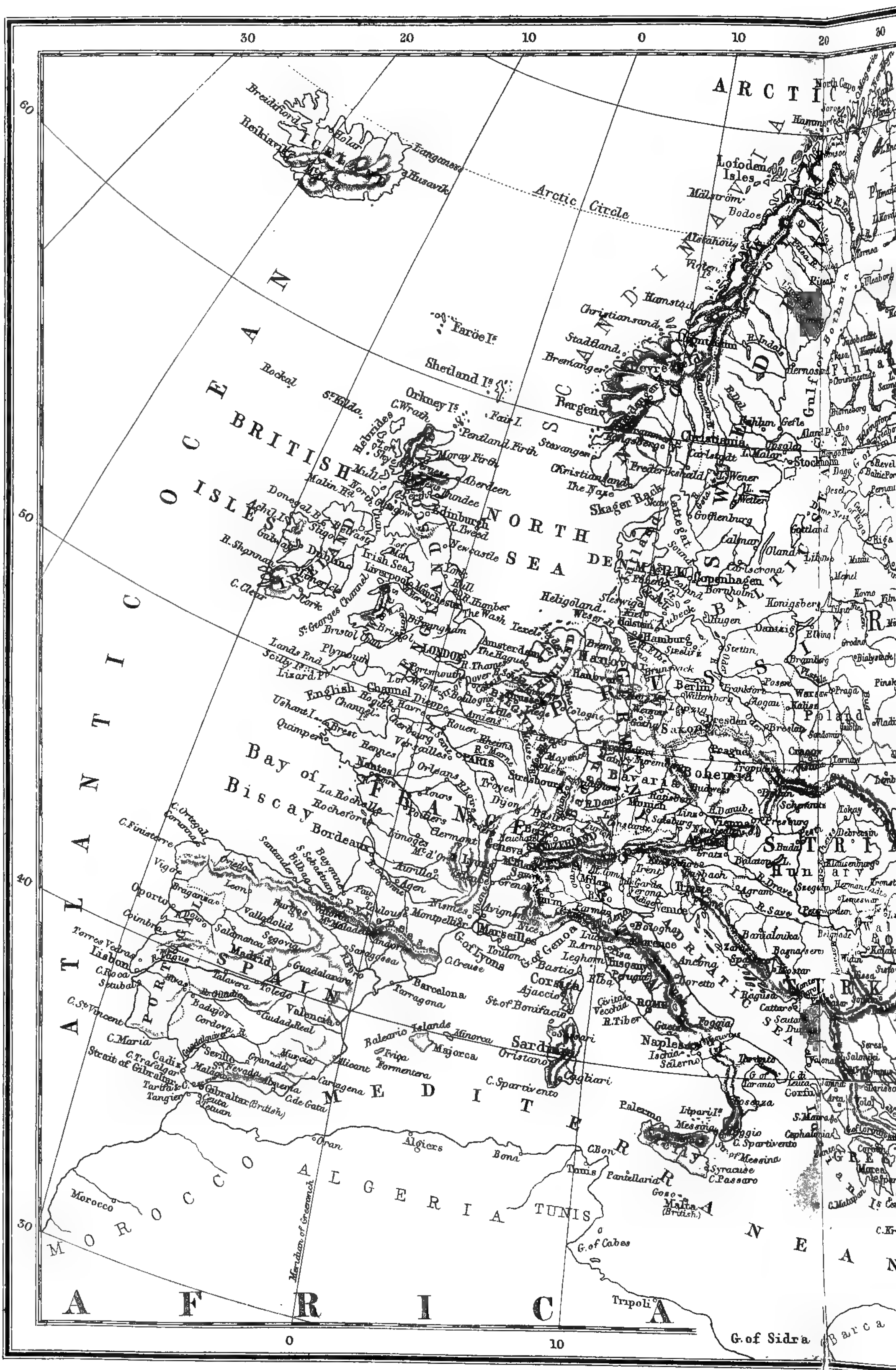
As the details of the geography of E. are given under the names of its several political divisions, and of its lakes, rivers, &c., little falls to be said under the present head. Appended, however, is a table of the countries of E., with their forms of government, extent, &c. The figures are taken from the *Almanach de Gotha* for 1862.

States.	Form of Government.	Extent in Eng. sq. m.	Population.	No. of Inh. per Eng. sq. m.
Andorra	Republic, with a sovereign council	189	15,000	79
Anhalt-Bernburg	Duchy, limited sovereignty, one chamber	315	56,031	178
Anhalt-Dessau-Köthen	Duchy, absolute sovereignty	840	119,515	142
Austria	Absolute monarchy	247,003	35,019,058	142
Baden	Grand duchy, limited sovereignty, two chambers	5,839	1,335,952	229
Bavaria	Limited monarchy, two chambers	29,084	4,615,748	159
Belgium	Limited monarchy, two chambers	11,268	4,671,187	415
Bremen	Republic, senate and burgher assembly	74	88,856	1201
Britain, Great, and Ireland	Limited monarchy, two houses of parliament	121,262	29,307,199	242
Brunswick	Duchy, limited monarchy, one chamber	1,410	274,069	194
Denmark	Limited monarchy, two chambers	61,488	2,577,000	42
France	Monarchy, two chambers	204,928	36,746,417	179
Frankfurt	Republic, senate, and legislative assembly	38	79,278	2086
Greece	Limited monarchy, senate, and legislative chambers	18,912	1,067,216	57
Hamburg	Republic, senate and burgher assembly	134	222,379	1660
Hanover	Limited monarchy, two chambers	14,672	1,843,976	126
Hesse-Cassel	Electorate, limited sovereignty, two chambers	3,648	726,686	199
Hesse-Darmstadt	Grand duchy, limited sovereignty, two chambers	3,206	845,571	264
Hesse-Homburg	Landgraviate, absolute sovereignty	105	25,746	245
Holland	Limited monarchy, two chambers	13,464	3,521,416	262
Ionian Islands	Republic, senate, and legislative assembly	1,005	227,106	226
Italy	Limited monarchy, two chambers	95,861	21,728,529	227
Liechtenstein	Principality, one chamber	60	7,150	119
Lippe-Detmold	Principality, one chamber	432	106,086	246
Lubeck	Republic, senate, and burgher assembly	125	55,423	443
Mecklenburg-Schwerin	Grand duchy, limited sovereignty, two chambers	5,126	546,639	107
Mecklenburg-Strelitz	Grand duchy, limited sovereignty, two chambers	1,039	99,628	96
Montenegro	Principality, sovereignty, limited by an assembly	1,680	120,000	71
Nassau	Duchy, limited sovereignty, two chambers	1,795	449,050	250
Oldenburg	Grand duchy, limited sovereignty, one chamber	2,394	294,359	123
Papal States	Papal government	4,502	690,000	153
Portugal	Limited monarchy, two chambers	38,663	3,908,861	101
Prussia	Limited monarchy, two chambers	107,183	17,739,913	166
Reuss	Principality, limited sovereignty, one chamber	457	121,203	265
Russia, with Poland and Finland	Absolute monarchy	2,041,950	66,891,493	33
San Marino	Republic, sovereign council	24	8,000	333
Saxony	Limited monarchy, two chambers	5,710	2,122,148	372
Saxe-Altenburg	Duchy, limited sovereignty, one chamber	504	137,075	272
Saxe-Coburg-Gotha	Duchy, limited sovereignty, one chamber for each duchy	751	153,879	205
Saxe-Meiningen-Hildburghausen	Duchy, limited sovereignty, one chamber	903	168,816	187
Saxe-Weimar-Eisenach	Grand duchy, limited sovereignty, one chamber	1,385	267,112	193
Schaumburg-Lippe	Principality, limited sovereignty, one chamber	169	30,144	178
Schwarzburg-Rudolstadt	Principality, limited sovereignty, one chamber	365	70,030	192
Schwarzburg-Sondershausen	Principality, limited sovereignty, one chamber	324	62,974	194
Spain	Limited monarchy, two chambers	193,519	15,454,514	80
Sweden and Norway	Limited monarchy, two chambers for Norway, and four for Sweden	294,641	5,129,538	17
Switzerland	Republican confederation, with diet,	15,529	2,534,242	163
Turkey, with Moldavia, Wallachia, and Servia	Absolute sovereignty	200,991	17,932,472	89
Waldeck	Principality, limited sovereignty, one chamber	455	57,550	126
Würtemberg	Limited monarchy, two chambers	7,439	1,785,952	240
	Total	3,762,860	282,058,186	74·96

Geology.—The geology of E. is most conveniently considered under the different countries. See also ALPS, PYRENEES, &c.

Natural History.—The natural history of E. very much agrees with that of the corresponding latitudes of Asia. As the mountain systems and the plains of the one continent extend into the other, so also do their floras and faunas. The natural history of the European countries on the Mediterranean Sea is very similar to that of Syria and of Asia Minor. The natural history of the more northern regions of E. resembles that of the great plains of Central Asia and Siberia. The most northern regions have the strictly arctic flora and fauna common in a great measure to all the arctic and subarctic regions, European, Asiatic, and American; whilst the natural history of the most southern countries assumes a sub-tropical character. The European countries near the Mediterranean produce fewer of the shrubby and odoriferous *Labiatæ* than the Caucasus and adjoining regions, whilst the *Caryophyllaceæ* are more abundant. The extreme abundance of *Cistaceæ* may be mentioned as a peculiar feature of the flora of Spain and Portugal. The *Primulaceæ* are particularly plentiful in all the Alpine regions of the south of E., but this characteristic is in some measure shared by the Himalaya. A great abundance of umbelliferous and cruciferous plants is a characteristic of all Europe. In no other part of the world do they form so large a proportion of the flora.

The temperature of the western and northern parts of E. being raised by the Gulf-stream and the winds from the great mass of dry and desert land in Africa above what is elsewhere found in similar latitudes, the flora and fauna exhibit a corresponding character, affected, however, by the great amount of moisture derived from the Atlantic Ocean; and also to a still greater degree by the comparative uniformity of temperature which the proximity of the ocean produces. The effect of the last-mentioned causes is so great, that the northern limit of some plants is sooner reached on the shores of the Atlantic than in the more central parts of E., where the winters are much colder, and the average temperature of the year is lower. Of this the vine is a notable example, and maize may be mentioned as another. Plants which require a mild



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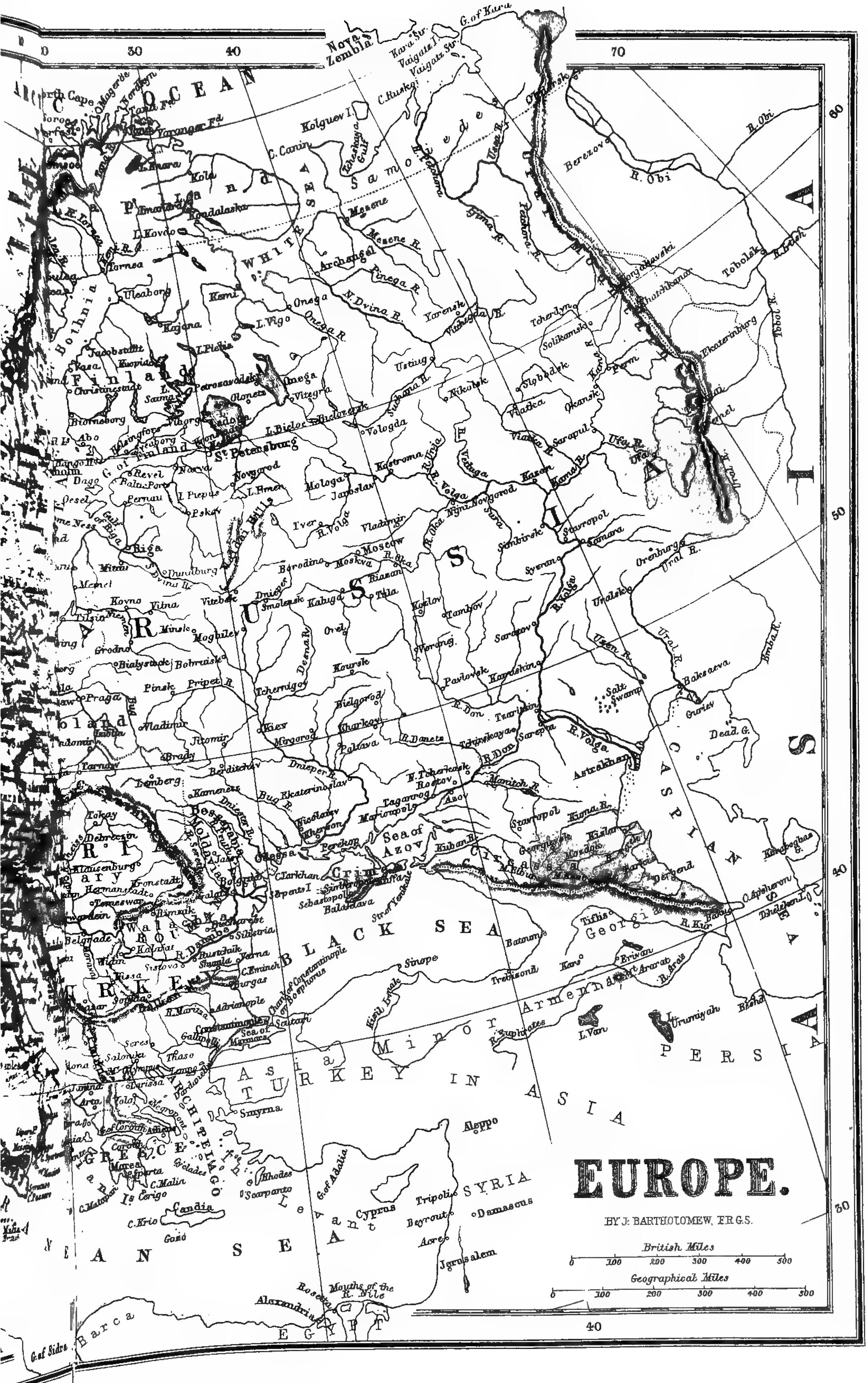

EUROPE.

BY J. BARTHOLOMEW, F.R.G.S.

LONDON & EDINBURGH

winter will not grow in the north—and scarcely even in the centre of E.—but they advance along the western coast under the influence of the maritime climate. Thus the myrtle—although not indigenous—grows even in the south of England.

Amongst plants, the date palm, and amongst animals a species of ape, are found in the south of E. (the ape only on the Rock of Gibraltar); whilst some strictly African birds are frequent visitants, and many birds—as the cuckoo, swallow, &c.—are common to E. and Africa, inhabitants in summer even of very northern regions, and returning in winter to the warm south.

Of the plants now most commonly associated in our thoughts with the southern countries of E., many have probably been introduced from Africa, or from the East. This has probably been the case even with the myrtle, and certainly has been the case with the vine, the olive, the orange, lemon, &c., the fig, the peach, the almond, the apricot, &c. Some of the most extensively cultivated fruits are certainly indigenous to E., as the apple, pear, plum, and cherry, although even of these the first improved varieties may have been introduced from the earlier seats of civilisation in the East. Among the wild animals of E. at the present day, the aurochs or bison is still reckoned; and the ox existed at no very remote period in a truly wild state. The reindeer inhabits the extreme north of E.; the elk, the stag, the fallow-deer, and the roebuck, are found in more southern regions; the ibex or bouquetin exists on the high central mountains; two species of antelope—the chamois of the Alps, and the saiga of the Russian plains—connect the European fauna with the Asiatic and African. Of carnivorous animals, the most worthy of notice are the bear, the wolf, the fox, and the lynx.

The abundance of lakes and streams in the northern parts of E. is accompanied with a corresponding abundance of water-fowl (*Anatidæ*) and of fish. Of the latter, the *Salmonidæ* are the most valuable, and the *Cyprinidæ* next to them. The European seas afford valuable fisheries, particularly of herring and of cod in the north, and of tunny, anchovy, &c., in the Mediterranean.

The common hive bee and the Ligurian bee may probably be regarded as natives of Europe. The silk-worm was introduced from the East. Another valuable insect, the cochineal insect, was introduced from America; but the *Cantharis*, or Blistering Fly, is truly indigenous to the south of Europe.

EURY'ALE, a genus of plants of the natural order *Nymphæaceæ*, or Water-lilies, closely allied to VICTORIA (q. v.), although of very different appearance. *E. ferox* is a water-lily with small red or violet-coloured flowers, leaves about a foot in diameter, the leaf-stalks and calyces covered with stiff prickles; a native of India and China. The fruit is round, soft, pulpy, and of the size of a small orange, composed of a number of carpels, and containing round black seeds as large as peas, which are full of a nutritious agreeable farina, and are eaten roasted. The root-stock also contains starch, which may be separated and used for food; and the root itself is eaten. The plant is said to have been in cultivation in China for upwards of 3000 years.

EUSE'BIUS, of Cæsarea, the father of ecclesiastical history, was born in Palestine about 264 A. D. He took the surname of Pamphili from his friend Pamphilus, Bishop of Cæsarea, whom he faithfully attended for the two years (307—309) in which he suffered imprisonment during the persecution of Diocletian. He then went to Tyre, and afterwards to Egypt, where he himself was thrown into prison on account of his religion. In 315, he succeeded Agapius as Bishop of Cæsarea, took a prominent part at the Council of Nice in 327, and died about 340.—E. was the head of the semi-Arian or moderate party in the Council of Nice. That party were averse to discussing the nature of the Trinity, and would have preferred the simplicity of Scripture language in speaking about the Godhead to the metaphysical distinctions of either side. They regarded Trinitarianism, on the one hand, as logically indefensible, but, on the other, they recognised the fact, that Scripture sometimes spoke of the Son in terms not compatible with the views of Arius, and therefore they wished each man to enjoy the utmost freedom in his interpretation of Scripture on this point. E. thought that the great thing was to lay to heart the truth, that 'God so loved the world that he gave his only begotten Son, that whosoever believeth on him should not perish, but have everlasting life.' The promise is to him that *believeth on him*, not, he argues, to him that *knows how he is generated from the Father*. He was very reluctant to accept the term *homoousios* (of the same substance), devised by Athanasius to describe the equality of the Son with the Father, and retained the kindliest feelings towards Arius after the views of the latter were condemned. His moderation and other excellent qualities procured him the favour of Constantine, who declared that he was fit to be the bishop of almost the whole world. E. has the reputation of being the most learned Father of the church after Origen. His chief works are—1. The *Chronicon*, a history of the world down to the celebration of Constantine's *Vicennalia* at Nicomedeia and Rome, 327 and 328 A. D. It is valuable as containing extracts from such writers as Berosus, Sanchoniathon, Polyhistor, Cephalion, and Manetho. It was first published in a complete state by Mai and Zohrab, at Milan, in 1818, from an Armenian MS. version discovered at Constantinople. 2. The *Præparatio Evangelica*, in 15 books, a collection of such statements in old heathen authors as were fitted to make the mind regard the evidences of Christianity in a favourable light. It was translated into Latin, and appeared at Treviso in 1480. The Greek text was first published at Paris in 1544. 3. *Demonstratio Evangelica*, in 20 books, a work intended to convince the Jews of the truth of Christianity from the evidence of their own Scriptures. A Latin version of this was printed as early as 1498; the Greek original did not appear till 1544, when it was published along with the *Præparatio* at Paris, by R. Stephens. 4. The *Ecclesiastical History*, in ten books. This relates the principal occurrences which took place in the Christian Church till the year 324, and contains the results of his studies in numerous libraries, and even in the imperial archives, the Emperor Constantine having ordered, at E.'s request, an examination of all documents relative to the history of martyrs. One drawback of the work is, that E., on principle, withholds all account of the wickedness and dissensions of Christians, inasmuch as he did not consider such stories for the edification of the church. A Latin translation of the work by Rufinus was published at Rome in 1474; the Greek text at Paris in 1549, and at Geneva in 1612. Among the more recent editions are those of Heinichen (Leip. 1827) and Burton (Oxford, 1838). The *Ecclesiastical History* has been translated into English, German, French, &c. Besides the foregoing works, may be mentioned the *De Martyribus Palestinæ*, a book against Hierocles; another against Marcellus; and a *Life of Constantine*. The first edition of all E.'s works appeared at Basel in 1542.

EUSE'BIUS, of Emisa, was born at Edessa, studied at Alexandria, and was the pupil of Eusebius Pamphili, and the friend of Eusebius of Nicomedia. Averse to all theological controversies, he declined the bishopric of Alexandria, vacant by the deposition of Athanasius. He was afterwards, however, appointed Bishop of Emisa, but during his ordination, a Christian mob, accusing him of 'mathematics' and magic, created a tumult, and obliged him to flee for his life. Subsequently, he returned to Emisa, where he was 'tolerated,' in spite of his dangerous knowledge! He died at Antioch in 360. The Emperor Constantius was much attached to E., and used to take him with him on his military expeditions. E. was accused of Sabellianism (q. v.), and Jerome calls him 'the ringleader of the Arian party.' Jerome, however, was rash in his epithets, and it is more probable that he belonged to the party of his namesake of Cæsarea, the Semi-Arians, or peace-party, who wished the doctrine of the Godhead expressed in the language of Scripture, and not of theology. The homilies extant under his name have been published by Augusti (Elberf. 1829). The genuine ones display great eloquence. Other writings by him, as, for example, the *Quæstiones XX. Evangelicæ*, and part of the *Commentarius in Lucam*, were published by Mai, in the *Scriptorum Veterum Nova Collectio* (vol. i. Rome, 1825). See Thilo, *Ueber die Schriften des E. von Emisa* (Halle, 1832).

EUSE'BIUS, of Nicomedia, Patriarch of Constantinople, born towards the end of the 3d c., was first tutor to the Emperor Julian, to whom he was related by the mother's side; then Bishop of Beryta (Beyrout), in Syria, and afterwards of Nicomedia. In order to secure his position, he appeared as the defender of Arius at the Council of Nice, and afterwards placed himself at the head of the Arian party. Under the Emperor Constantine, whom he baptized in 337, he became Patriarch of Constantinople. He died in the year 342, after having, in the previous year, held an assembly of the church for the establishment of Arianism at Antioch. It is not easy to get at his real character. We have no ecclesiastical works by Arian writers, our only sources of information as regards the character and opinions of that party being their enemies—the orthodox party; yet, making the ordinary allowance for partisanship, there would seem to be sufficient reason for concluding that E. was cunning and double-tongued when occasion required, and imperious and violent when he had power in his hands. Athanasius considered him not the disciple, but rather the teacher of Arius. From him the Arians are sometimes styled Eusebians. See Neander, *Kirchengeschichte*, vol. ii. p. 773, &c.

EUSTACHIAN TUBE. See Ear.

EUSTACHIAN VALVE. See Fœtus.

EUSTA'CHIUS, Bartolommeo, an Italian anatomist, who was born in the early part of the 16th c., and died in 1574. Few particulars are known regarding his life, but we learn from the introduction to one of his works, that in 1562 he was professor of medicine in the Collegio della Sapienza at Rome. His name is indelibly associated with anatomical science, through his discoveries of the tube in the auditory apparatus, and the valvular structure in the heart, which have been called after him. He was the first to give an accurate description of the thoracic duct, and was probably the first to notice and describe the stapes (one of the chain of small bones crossing the tympanic cavity of the ear), a discovery which, however, Fallopius assigns to Ingrassias. He likewise contributed materially to the diffusion of more accurate knowledge regarding the development and evolution of the teeth, and the structure of the kidney. These discoveries are recorded in his *Opuscula Anatomica*, published at Venice in 1563. He was the first anatomical writer who illustrated his works with good engravings on copper. The *Tabulæ Anatomicæ*, which he was probably unable to publish in consequence of the poverty of which he complains in the introduction to which we have already referred, did not appear until 1714, when they were edited, with explanatory remarks, by Lancisi. Their value is sufficiently evidenced by the fact, that Albinus published a new edition, with an excellent Latin commentary, in 1743, at Leyden; that Bonn published a Dutch edition in 1798 at Amsterdam; and that a German edition appeared in 1800. Lauth, in his *History of Anatomical Discovery*, remarks that if the *Tabulæ* had appeared in E.'s lifetime, anatomy would have attained the perfection of the 18th c., nearly 200 years earlier. E., Vesalius, and Fallopius may be regarded as the three great founders of modern anatomy.

EUSTA'THIUS, the celebrated Greek commentator on Homer and the geographer Dionysius, was born at Constantinople. He was at first a monk, then a deacon and teacher of rhetoric in his native city, and, in the year 1155, was appointed Archbishop of Thessalonica, where he died in 1198. E. was profoundly versed in the ancient classic authors, and a man of prodigious acquirements, as is proved by his commentaries. The number of authors whom he quotes is almost incredible, and the value of his quotations is heightened by the consideration, that most of the works from which he extracts are no longer extant. His most important work is his *Commentary on the Iliad and Odyssey of Homer*. The first edition appeared at Rome 1542—1550; the last at Leip. 1825—1829. The work is open to objection on the score of method, and is diffuse and digressive, but it is nevertheless a vast mine of knowledge for students of Homer. Of a similar character is E.'s *Commentary on Dionysius*, first printed by Stephens (Paris, 1547), and lastly in Bernhardy's edition of Dionysius (Leip. 1828). Of his commentary on the hymns of Pindar, only the *Prooemium* has come down to us. It was first published by Tafel in 1832, along with E.'s theological treatises and letters.

EUSTA'TIUS, St, one of the Dutch West India Islands, lies near the north-east bend of the great arch of the Antilles, about twelve miles to the north-west of St Christopher. Lat. 17° 31′ N., and long. 63° 5′ W. Area, 190 square miles. St E. is a pyramidal rock of volcanic formation, shewing two extinct craters, and being still subject to earthquakes. Hurricanes also of intense severity occur, more particularly in August and September. Along its entire circuit of 29 miles, St E. has only one landing-place, which, besides being difficult of access, is strongly fortified. The whole mountain is fertile, producing in abundance not merely commercial crops, such as sugar, cotton, and tobacco, but also provisions of various kinds, such as maize, hogs, goats, and poultry. Pop. about 2000.

EUTE'RPE (i. e., she who delights), one of the nine Muses, was the daughter of Zeus and Mnemosyne. She was the muse of lyric poetry, and is represented in ancient works of art with a flute in her hand. See Muses.

EUTE'RPE, a genus of palms, having male and female flowers intermingled on the same spadix, the spadices springing from beneath the leaves; the spathe entire, membranaceous, and deciduous. They are very elegant palms; with lofty, slender, smooth, faintly ringed stems; and pinnate leaves, forming a graceful feathery plume; the bases of the leaf-stalks sheathing far down the stem, and so forming a thick column of several feet in length at its summit. To this genus the cabbage palm of the West Indies, and the Assai palm of the banks of the Amazon, are often referred. See ARECA and ASSAI.

EUTRO'PIUS, a Latin historian, concerning whom we only know that he filled the office of secretary to the Emperor Constantine, fought against the Persians under Julian, and was still alive in the reign of Valens. The period of his death is unknown. His *Breviarum Historiæ Romanæ*, giving a short narrative of Roman history from the foundation of the city to the time of the Emperor Valens, is written in an extremely simple and pure style, and appears to have been originally intended for the use of schools. It became very popular as the taste for original investigation declined, in that dark period between the death of the old world and the birth of the new; and is either copied or followed by the early monkish annalists. An edition with enlargements, however, was published by Paul, son of Warnefrid ud Theodolinda, generally known as Paulus Diaconus. Others continued it down to the year 813. The History existed in three distinct forms at the revival of letters: there was first the genuine work of E. in ten books; second, the expanded editions of Paul; and third, a very complete, but also largely interpolated copy contained in the *Historia Miscella*. The *editio princeps*, printed at Rome in 1471, was from the impure text of Paul. The best editions in modern times are those of Tzschucke (Leip. 1796, improved 1804), and of Grosse (Halle, 1813; Leip. 1825).

EU'TYCHES, a Byzantine ecclesiastic of the 5th c., and a zealous but unskilful representative of the dogmatic opinions of Cyril of Alexandria. In opposing the doctrines of Nestorius, he fell into the opposite extreme, and taught that after the union of the two natures in Jesus Christ, the human nature was absorbed in the divine; an opinion which spread extensively through the Alexandrian Church. E. was in consequence summoned before a synod at Constantinople in the year 448, and deposed by Flavianus, patriarch of that city; but his cause was warmly espoused by the eunuch Chrysaphius, chief minister of the Emperor Theodosius II., and Dioscurus, Bishop of Alexandria, who were both opposed to Flavianus. Chrysaphius induced the emperor to call a general council at Ephesus in the following year, under the presidency of Dioscurus. Measures were taken beforehand to secure a triumph over the anti-Eutychians. Soldiers were admitted to the deliberations of the council, to overawe the party of Flavianus; while a crowd of fierce Egyptian monks, devotedly attached to whatever was popular in Alexandria, or had been countenanced by their old pupil Cyril, drowned by their fanatical outcries the voices of those who ventured to speak against Eutyches. The result was that the judgment of the previous council was reversed; Flavianus and his adherents were deposed, and the doctrine of E. affirmed to be orthodox, and in accordance with the Nicene creed. His triumph, however, lasted only two years; in 451, Eutychianism was pronounced heresy at the Council of Chalcedon, attended by 650 bishops; and in opposition to his views, it was declared that in Christ the two natures were united without confusion or conversion of substance. Nothing further is known concerning E., except that Leo wrote to the Emperor Marcian to banish him from the capital. The sect of Eutychians, however, under the name of Monophysites, continued to exist quietly for a century after his death, in the Armenian, Ethiopian, and Coptic churches, when it awoke to new life under the auspices of Jacob Baradæus, who died Bishop of Edessa, 588 A.D. His followers were called Jacobites, and have perpetuated the Monophysite doctrine in the Armenian and Coptic churches to the present day. See Neander, *Kirchengeschichte*, vol. iii. p. 1079, &c.

EU'XINE (Gr. *Euxinos*, hospitable) is the name applied by the ancients to the Black Sea (q. v.). Before receiving this name it was called *Axenos Pontos*, the inhospitable sea, because of the black and turbulent weather so frequently ascribed to it by the ancient poets, and the reported cannibalism of the Scythian tribes who lined its northern shores. It seems to have been called the *Euxine*, or hospitable sea, after the establishment of Greek colonies on its borders, and when its waters were thrown open to Greek commerce.

EVA'NDER, a semi-mythical Grecian hero of antiquity, was, according to Roman traditions, the son of Hermes, by Carmenta or Tiburtis. About 60 years before the Trojan war, he is said to have led a Pelasgian colony from Pallantium, in Arcadia, to Italy, and to have landed on the banks of the Tiber, and near the foot of the Palatine Hill. Here he built a town, naming it Pallantium, after the one in Arcadia. At a later period, it was incorporated with Rome, and is affirmed to have originated the names Palatinus and Palatium. Tradition represented E. as having done much to introduce the habits of social life among his neighbours; he prescribed for them milder laws, and taught them, among other arts, those of music and writing. To him is also ascribed the introduction of the worship of the Lycæan Pan, with that of Demeter, Poseidon, and other deities. Virgil represents him as being still alive when Æneas arrived in Latium after the sack of Troy. E. was worshipped both at Pallantium, in Arcadia, and at Rome.

EVANGE'LICAL is an adjective derived from the Gr. *euanggelion*, 'good news,' or 'the Gospel,' and is applied in general to anything which is marked by the spirit of the gospel of Jesus Christ. Thus, we speak of an evangelical sermon, of evangelical piety, evangelical views, &c., though it is but right to mention that the term 'evangelical' in such a connection is used by a portion of the religious community to denote, not so much a spirit or sentiment resembling that of the Saviour, but certain peculiar theological opinions, which are held to constitute the only true and complete expression of Christian belief. In England and Scotland, dissenters have generally laid claim to be considered more 'evangelical' than the national churches—i. e., they conceive that they have borne, and still bear, more decided testimony than their brethren of the Establishment to the truth of such doctrines as the total depravity of human nature, the imputation of Adam's sin to his posterity, the expiatory character of Christ's sufferings, justification by faith in the atoning efficacy of these sufferings, &c. In the Anglican Church, however, the rise of the Puseyite or Tractarian party has brought into prominence an antagonistic party, resembling dissenters very much in their theological tenets. This party calls itself, *par excellence*, 'Evangelical.'—In Prussia, the term Evangelical has been employed by the government since 1817 to designate the national Protestant Church, formed by the union of the Reformed or Calvinistic and the Lutheran Churches, a union unhappily too much enforced by severe and even coercive measures, and which, partly on that account, and partly from the invincible repugnance of the more extreme or High Church Lutherans, has not been so perfectly accomplished as the government wished. See PRUSSIA.

EVANGELICAL ALLIANCE, an association of 'evangelical Christians belonging to various churches and countries,' formed in 1845, 'to associate and concentrate the strength of an enlightened Protestantism against the encroachments of Popery and Puseyism, and to promote the interests of a scriptural Christianity.' Its origin is to be ascribed to a deep sense of the evil of the divisions existing among Protestants, who nevertheless agree in holding the essential principles of the Reformation. A number of circumstances concurred to direct the attention of Christians both in England and Scotland very strongly to this subject; and a requisition, signed by ministers and others belonging to various denominations in Scotland, was addressed to 'the evangelical churches of England, Wales, and Ireland,' convening a meeting to be held at Liverpool in October 1845. To this requisition a cordial response was given; the meeting was numerously attended by persons of great influence, both in the established and dissenting churches; great harmony prevailed; and the E. A. was then organised. It now has branches in the most important cities and towns of Britain, and of many other parts of the world; it has contributed to the promotion of Christian union, fellowship, and brotherly co-operation, and at least as evidently on the continent of Europe as in Britain; affording at the same time much encouragement to those who in various countries of the continent were struggling in the feebleness of isolation against all the forms of opinion most adverse to the principles of the Reformation, but to whose support the strength of British Protestantism has been in some measure brought. The E. A. seeks, by various means, to promote the cause of 'Evangelical Protestantism,' and to oppose 'Infidelity, Popery, and other forms of superstition, error, and profaneness, especially the profanation of the Lord's Day.' It has also ventured to remonstrate against the persecution still practised in some Protestant countries of the north of Europe both against Protestant dissenters and Roman Catholics, and thus has sought to extend the influence of the principles of toleration. The meetings which have been held under its auspices in continental cities have also led to much temperate and friendly discussion on various important questions. Great meetings of the E. A. were held at Paris in 1855, at Berlin in 1857, and at Geneva in 1861.

The E. A. adopted as its basis a brief statement of the points of doctrine on which its members must hold 'what are usually understood to be evangelical views.' This gave rise to objections against it on the part of some who would gladly have joined it, but for an apprehension of compromising principles to which they did not think due place was given. The *High Church* party in the Church of England, and in the churches of Germany, Sweden, &c., have been consistent opponents of the Evangelical Alliance. It is of course equally opposed, on other grounds, by rationalists.

Its basis excludes those who, although otherwise holding evangelical doctrines, deny 'the divine institution of the Christian ministry, and the authority and perpetuity of the ordinances of baptism and the Lord's Supper.' Few Americans are connected with the E. A., owing to difficulties arising out of the question of slavery.

EVANGELICAL ASSOCIATION, a religious body which was organised in 1803 among Germans in the United States of North America, and has considerably extended itself both in that country and in Canada, being no longer chiefly confined, as it was at first, to German immigrants and their descendants using the German language. Its doctrines are a modified Calvinism; its church government a modified episcopacy.

EVANGELICAL UNION, the name assumed by a religious body constituted in Scotland in 1843 by the Rev. James Morison of Kilmarnock and other ministers whose doctrinal views had been condemned in the United Secession Church, to which they previously belonged, and the congregations adhering to them. They were soon afterwards joined by a number of ministers and congregations of similar views, previously connected with the Congregational Union or Independents of Scotland, and have since extended themselves considerably in Scotland and the north of England. Their doctrinal views are those which, from the name of Mr Morison, have now become known in Scotland as *Morisonian*. See MORISONIANISM. Their church-government is Independent, but in some of the congregations originally Presbyterian, the office of the eldership is retained. A notable practice of this denomination is the very frequent advertising of sermons and their subjects.

EVA'NGELIST, literally, a bringer of good tidings. It designates, in the New Testament, a person appointed by an apostle to itinerate among the heathen, and so prepare the way for resident instructors. The evangelist, therefore, had no particular flock assigned to him, and is to be distinguished both from bishops and ordinary pastors. Later in the history of the early church, the evangelist figures, according to Eusebius, as 'a deliverer of the written gospels to those who were ignorant of the faith.' This may possibly imply that he acted as a colporteur, by distributing copies of the gospels, or that he read them to the heathen, and so made them familiar with their contents.—The word evangelist is also used to denote the four writers of the life and gospel of Jesus Christ, these being evangelists ('bringers of good tidings') *par excellence.*

E'VANS, LIEUTENANT-GENERAL SIR DE LACY, G.C.B., born at Moig, in Ireland, 1787; entered the army as ensign in 1807; in 1812, joined the 3d Light Dragoons, with whom he saw much Peninsular service. In 1814, he was present as brevet lieutenant-colonel of an infantry regiment at the capture of Washington, the attack on Baltimore, and the operations before New Orleans. He was next at Waterloo. In 1830—1831, he sat for Rye, and in 1833 was elected on the Liberal interest for Westminster, which he represented until 1841. The cause of the young queen of Spain was believed by the English ministry to be identified with that of freedom and constitutional government, and an order in council was issued in 1835, authorising the raising of 10,000 men for service in Spain, and expressing the king's desire that his subjects should take part with the queen of Spain, his ally, by entering the new corps. The command of the British auxiliary legion was offered to E., and he was allowed by his constituents to accept it without vacating his seat for Westminster. E.'s principal military exploits at the head of the British Legion were the storm and capture of the Carlist lines of Ayetta, near St Sebastian, in 1836; the storm and capture of Irun; and the capture of Oyarzun and Fontarabia. For these services, he received the grand crosses of St Ferdinand and Charles III. At the general election for 1841, E. was defeated for Westminster, but was re-elected in 1846, and continues to hold his seat (1861) by an undisputed tenure. He was promoted to the rank of major-general of the British army in 1846, and obtained the colonelcy of the 21st Foot in 1853. On the declaration of war against Russia, he was appointed to command the second division of the army sent out to the Crimea, with the rank of lieutenant-general. His division was hotly engaged in the battle of the Alma, and E. received a severe contusion of the shoulder. On the 26th October, during the siege of Sebastopol, his division was attacked by a force of 6000 Russians. E. met the enemy with great gallantry, and drove them back into the town. In February 1855, E. attended in his place, and received the public thanks of the House of Commons, through the Speaker, for his services in the Crimea. He was rewarded by the crown with the Grand Cross of the Bath, and by the Emperor of the French with the Grand Cordon of the Legion of Honour. He also received the degree of D.C.L. from the university of Oxford. He has taken a frequent part in parliamentary debates on matters of army administration. In politics, he has always belonged to the party of 'advanced Liberals.'

E'VANSVILLE, a flourishing town of Indiana, in the United States, stands on the right bank of the Ohio, about 150 miles south-west of Indianapolis. It is very advantageously situated for trade. From E. downwards, the navigation is seldom interrupted either by drought or by ice; and here terminates the Wabash and Erie Canal, the longest work of the kind in the American republic. Thus, the place connects the Lower Ohio at once with the inland lakes and with the Gulf of Mexico. Coal and iron ore abound in the vicinity. Pop. in 1859, 15,000.

EVA'PORATION, the conversion of a fluid or solid into vapour. Steam, vapours of alcohol, camphor, iodine, &c., are familiar instances. All fluids are surrounded by vapour at common temperatures; but for every substance there is a limiting temperature, below which no evaporation takes place. The pressure, or tension, of a vapour depends mainly upon the nature of the substance evaporated, and the temperature to which it is raised. The full amount of vapour, however, is not produced instantaneously, and therefore, in general, *time* is an element in the question as well as temperature. See DIFFUSION.

The Boiling-point (q. v.) is the temperature at which vapour is freely given off—i. e., at which the tension of the vapour of a substance is equal to the atmospheric pressure. Dalton gave an empirical law, which, however, is only at all approximate for temperatures near the boiling-point: 'The tension of the vapour of a substance rises in *geometric*, as the temperature rises in *arithmetic*, progression.' It is sufficient for our present purpose to notice, that the tension increases very rapidly with the temperature. Some curious consequences result from this. Thus, water boils at 212° F., under a pressure of 30 inches, or at that temperature the tension of its vapour is *one* atmosphere. At 162° F., or 50° below its boiling-point, its vapour has a tension of 10 inches of mercury, and it will therefore boil, if placed in the receiver of an air-pump, as soon as two-thirds of the air have been extracted.

If a little water be boiled in an open flask till the steam has displaced a great part of the contained air, and the flask be then tightly corked, the water will gradually cool. If the flask be now dipped in *cold* water, boiling recommences, the cold water having condensed some of the vapour, and so diminished the pressure on the contained liquid. Dip the flask in *hot* water, and the boiling ceases. These appearances may be obtained several times in succession.

A fluid cannot be heated above its boiling-point, at the ordinary pressure of the atmosphere; but if it be heated in a closed vessel, the tension of the vapour produced is to be taken in addition to the former pressure, and the boiling-point rises with it. Thus, when the pressure is equivalent to 2 atmospheres, the boiling-point of water is raised 40° F. At such temperatures, its solvent powers are greatly increased. Many minerals which are found in fine crystals are supposed to have been deposited from water which had dissolved them in large quantities, under the combined influences of pressure and temperature. Papin's Digester (q. v.) depends upon this principle.

The amount of evaporation from a fluid depends upon many circumstances. As, except in the case of actual boiling, it takes place only at the surface, the amount of surface exposed is an important consideration where rapid and copious evaporation is required, as in steam-boilers, salt-pans, &c. When, on the contrary, it is desirable to prevent evaporation as much as possible, a layer of oil, preventing direct contact with the air, is of great use. The rate of evaporation depends also on the pressure, and varies, according to Daniell, nearly inversely as the latter. His experiments, which appear trustworthy, were made in an exhausted receiver, and the vapour was removed as it was formed.

In the conversion of a fluid into vapour, a quantity of heat disappears; i. e., is required to produce and maintain the gaseous state. Thus, the temperature of steam at 30 inches is the same (to the thermometer) as that of the boiling water from which it comes off; but the heat necessary to convert a pound of water at 212° into steam at 212°, would raise nearly 1000 pounds of water from 60° to 61°. See HEAT, LATENT. When, therefore, a fluid evaporates, the vapour carries off heat from the fluid, and thus evaporation produces cold. This, of course, is matter of daily observation. Porous earthenware jars are employed to cool water in summer in this climate; and in India, ice is procured by exposing water in shallow pans, laid on straw, to the combined effects of evaporation and radiation at night.

On the same principle depends Sir John Leslie's method of freezing water. The water is placed in a flat porous dish, over a large surface of strong sulphuric acid, and the whole covered with the receiver of an air-pump. When a good vacuum has been produced, there is, of course, as we have already seen, a rapid evaporation, and the acid eagerly absorbing the vapour as it is formed, the process goes on without further working of the pump, till the residual water has become a solid cake of ice. A most extraordinary example of this production of cold is afforded by the freezing of water on a white hot plate—by no means a difficult experiment. A platinum capsule is heated nearly to whiteness by a lamp placed underneath; a little water, mixed with sulphurous acid, which is an extremely volatile liquid (indeed it is gaseous at ordinary temperatures and pressures), is poured upon the plate. The acid instantly evaporates, and the cold produced freezes the water, which can be dropped from the hot plate on the hand as a lump of ice.

Another remarkable instance of this occurs in the formation of solid carbonic acid. The liquid acid is forced by the pressure of its own vapour in a fine stream into the air from a nozzle in the strong iron vessel in which it is contained. It evaporates so rapidly in air that a portion of the stream is frozen, and the delicate snowlike mass can be collected by proper apparatus.

Having thus briefly examined some of the circumstances connected with evaporation, we may proceed to mention some of its important bearings on meteorology. In this respect, it is one of the most effective of all the gigantic processes that are continually going on around us. Watery vapour is continually rising invisible in the air; meeting with a colder stratum of the atmosphere, or the cold ridge of a mountain, it becomes condensed into mists or clouds; the fine particles of these unite into larger groups, and fall as rain, hail, or snow—to be again evaporated by heat from the moist ground, or from rivers, lakes, and seas. Even when otherwise invisible, its presence may be detected by its deposition as Dew (q. v.), and, according to Clausius, in the blue of the sky, and the gorgeous tints of sunrise and sunset. There is little doubt of its being also intimately connected with the scintillation of the fixed stars. See SCINTILLATION. Atmospheric electricity is largely due to evaporation directly as well as indirectly, on account of the amounts of vapour contained in different currents of air. It is matter of everyday observation how much the drying of the ground, or evaporation generally, is promoted by a brisk wind. This finds its explanation in the constant removal of the vapour as it is formed, the diffusion of the vapour taking place into comparatively dry air instead of the moist atmosphere into which it would take place in a calm. See RAIN and ELECTRICITY, ATMOSPHERIC.

EVE (Heb. *Chavvah*, i. e., the living), the name, according to the Hebrew narrative, of the wife of the first man, and so the mother of the human race. See ADAM AND EVE.

EVE'CTION, a lunar inequality resulting from the combined effect of the irregularity of the motion of the perigee, and alternate increase and decrease of the eccentricity of the moon's orbit. See LUNAR THEORY.

E'VELYN, JOHN, a well-known writer of the 17th c., was born October 31, 1620, at Wotton, the seat of the Evelyn family, in Surrey. He was educated at the free school of Lewes, and subsequently at Balliol College, Oxford. In 1640, he entered the Middle Temple, and in the following year, prompted by the ominous appearance of public affairs, and after having witnessed the trial of Strafford, he set out for the continent, returning, however, in the autumn of the same year. In 1642, upon offering his services to Charles I., he was accepted as a volunteer in Prince Rupert's troop, but in 1643 he again went to the continent, where he mainly lived during the following eight years. After 1652 he settled in England, where he lived studiously and in private till the Restoration, after which he was much employed by the government. On the organisation of the Royal Society, he became one of the first members, and was an industrious contributor to its Transactions. He succeeded in 1699 to the family estate at Wotton, and there, after a long, studious, and highly useful life, he died 27th February 1706.

His pen seems to have been constantly employed, and that upon a great variety of subjects. Art, architecture, gardening, commerce, &c., were all treated of by E., and in such a manner as to produce the most beneficial results on his own time. His principal works are—*Sculptura, or the History and Art of Chalcography and Engraving on Copper*, 1662; *Silva, or a Discourse of Forest Trees, &c.*, 1664; and his *Memoirs* (first published in 1818). It is to the last of these works E. owes the celebrity he now enjoys. The *Memoirs* are written in the form of a diary, by one who had accustomed himself to habits of close observation, and continued during a period of about 70 years—and these the most dramatic in the recent history of England. They are of inestimable value. Sir Walter Scott said that 'he had never seen a mine so rich.' A new edition was published in 1850, and another in 1854.

EVENING PRIMROSE. See ŒNOTHERA.

EVENING SCHOOLS may be divided into two classes: 1. Those which, either in the form of lectures or lessons, carry further the education received at school; 2. Those which exist to supplement the defects of early training, or, it may be, to give the simplest rudiments of elementary instruction to adults who are under the disadvantage of being pupils for the first time in their lives. The former are found chiefly in connection with mechanics' institutes* (which are now very numerous in Great Britain, and form one of the most important educational agencies we have), existing day schools, and congregational organisations; the latter more frequently fall under the head of parochial missionary work, or are connected with factories. These latter constitute the class of evening schools which engage the largest share of interest in the present condition of England, and which present the greatest difficulties in working.

The total number of evening schools of this humbler class at present in operation in England and Wales is 2036; of these, 1547 are conducted by the Church of England, 125 are Congregational, 108 British, 96 Roman Catholic, 73 Baptist, 37 Unitarian, 21 Wesleyan, 6 Jewish, 9 Non-sectarian, and 14 Ragged. The total number of scholars in attendance is 80,966, of whom 54,511 are male. In Scotland, *primary* evening schools are not so usual as in England; and this is no doubt to be greatly attributed to the more general diffusion of education among children of the poorer classes.

Considering the large proportion of the present adult population unable to read or write, the number of evening schools is miserably inadequate. But the necessity for their institution has not yet been sufficiently felt by the country, to lead to their taking a much more important place in the educational machinery of the nation than they have hitherto done. Her Majesty's inspectors, the Royal Commissioners (1861), and the clergy of all denominations, strongly recommend their greater extension. 'If the education of the country were in a good state,' say the commissioners, 'evening schools would be nearly universal, and would serve to compensate the scantiness of the instruction given in day schools, by giving more advanced instruction to an older class of scholars.'

State Aid, and Voluntary and Paid Teachers.—Many educationists have come to the conclusion, that the hope of retaining children in school until they have obtained as much instruction as is requisite for their guidance in life, is a vain one, and consequently look to evening schools as an indispensable part of a national system of education, and consider them entitled to look to the state for encouragement and support to an equal extent with day schools. Bishop Hinds was the first *publicly* to suggest that evening schools fairly come within the sphere of state action, in a letter to Mr Senior, printed in 1839. The recent inquiries have brought out that the majority of those who frequent existing evening schools have never received any elementary instruction, or have forgotten what they once knew, and that a large proportion are either adults or adolescent young men and women. They attend for the purpose of learning to read, write, and cipher. Though in many instances, especially where no fee is charged, the irregularity and unpunctuality of the attendance are great, yet in the majority of cases there is an earnest desire on the part of the pupils to benefit by the instruction they receive. It is a question of some national importance how far schools of this supplementary class should be left to the action of private philanthropy. It is also a question, to some extent implied in the other, whether the peculiarly delicate work required in evening schools is not more efficiently discharged by voluntary than by paid labourers.

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* The Working-Man's College in London, and the School of Arts in Edinburgh, both belong to this class.

1. As to the first question, it may be safely said, that all would desire to see those wholesome channels of benevolence which connect the poor and the rich free from government interference; but if, in our devotion to a theory, we neglect the work, it becomes the duty of the state to see to it, to the extent of encouragement at least, if not of direction. Since Bishop Hinds' letter, to which we have referred above, the education committee of the privy council have recognised this duty, and have given aid to a small extent to all evening schools complying with certain conditions, and in connection with day schools. By the revised code recently issued by the privy council, evening schools of this class are allowed to claim from the parliamentary grant 1d. for every attendance of a pupil above twelve attendances. The schools must be taught by certificated masters, and lay persons are alone recognised. To all those schools frequented for the purpose of confirming or extending previous knowledge, this new code will be of great assistance, as there is a tendency to engage trained teachers for such schools; to those which are chiefly frequented by adults wholly ignorant of the simplest elements, and chiefly conducted by voluntary teachers, it will afford little or no advantage, because the conductors will not be able to claim so large a sum as would suffice to pay the salaries of certificated masters. Nor, perhaps, is it desirable to interfere with this particular class of evening schools; it is of more importance, so far as state aid is concerned, that the education of the primary school should be confirmed by the establishment of evening schools for *boys and girls*. There is active benevolence enough abroad to overtake the ignorance of the *adult* population, if properly stimulated by the various religious bodies.

The proposed new arrangements as to payment may also lead to the greater separation of such schools into schools for boys and girls above 13 and under 18, and schools for adults. It is found that boys and men, girls and women, do not work well together.

2. As to the second question: in those evening schools which are only a continuation of the day school, the same method will generally be found to suit as in the primary schools; and therefore it seems advisable that they should be conducted by paid certificated teachers, acting under managers (as in the case of ordinary day schools), and claiming grants from the privy council. Those schools, again, which are frequented by adults, who come to receive the elements of reading, writing, and arithmetic for the first time, require more delicate handling, and a greater consideration of individual character and wants than are requisite in a school attended by boys and girls. In such cases, voluntary effort under the influence of religious or merely philanthropic motives appears to be the best agency. The ignorance of method displayed by such teachers, and the irregular manner in which many of them hang to their work, are no doubt serious difficulties; but they may be overcome by the institution of diocesan or other unions, in imitation of the East Lancashire Union of evening schools under the presidency of Sir J. P. K. Shuttleworth, with each of which might be connected an organising master, who should itinerate among the schools, giving the benefit of his superior knowledge of method.

Subjects and Method.—As to subjects to be taught, we have little to say to that class of evening schools which continue the work of the day school. It is to be presumed that practical instruction (and what else should be aimed at in such schools?) will embrace the elements of those sciences which bear most directly on life. We refer to social economy and the laws of health. Evening schools of the humbler and more urgent sort will necessarily confine themselves to reading, writing, and arithmetic, inventing such methods of teaching those subjects as will most directly touch the intelligence and engage the interest. The short period of attendance requires that *much* be done rather than *many things.* Through a well-constructed course of reading-books (unfortunately, there is no reading series for adults worthy of mention), all the general culture and specific information attainable will best be given. If such reading-books do not furnish adequate information on social economy in its domestic and its wider social relations, and on the laws of health, they sadly misunderstand their position in educational literature. Instruction in writing and arithmetic should be given in such a way as will naturally connect itself with the lives and daily necessities of the learners. But this is not the place to treat of the subject of method.

History.—Although we have directed attention to the fact, that Bishop Hinds was the first in this country to advocate state recognition for evening schools, he was by no means the first to feel the necessity that existed for them. The first school established exclusively for adults was at Bala, in Merionethshire, in 1811, by the Rev. T. Charles. In 1812, a similar school was set on foot in Bristol by William Smith and Stephen Prout, a school which led to the establishment of the 'Bristol Institution for instructing adults to read the Holy Scriptures.' In 1813, writing was included in the school programme; and in 1816, a society of the same kind was founded in London. In the course of a few years, thirty towns possessed similar schools. The first *evening* school proper for instructing boys and girls who had to work all day for a livelihood, was founded in 1806 at Bristol, by the 'Benevolent Evening Schools' Society.' The present statistics of evening schools have been already given.

In other countries of Europe, evening schools, where they exist, have mainly in view the continuance of the education already received in primary schools. In France, however, the wants of untaught adults have been provided for by the establishment by law of evening schools suited to them. In all the states of Germany, provision is made more or less in the country districts, and always in the large towns, for continuing the instruction given in the primary schools. Schools for those who wish to learn reading and writing for the first time seem scarcely to exist, probably because they are not needed. The schools which do exist have a greater affinity to our Mechanics' Institutes than to any other kind of institution in this country. The instruction is given on Sundays and holidays, and in many places also on one or two evenings in the week. But Sunday instruction seems alone to have been originally contemplated. The subjects taught are the ordinary branches, with geography, free-hand and geometrical drawing, geometry, and in some cases the elements of natural science and the laws of health. These institutions are supported by the funds of the commune or district; in some cases supplemented by the state.

E'VERETT, Alexander Hill, an American diplomatist and author, was born at Boston, in Massachusetts, 19th March 1792, and entered Harvard College in 1802. In 1806, although the youngest of the *alumni*, he graduated with the highest honours. After practising for some time as a lawyer, he was appointed United States ambassador at the Hague in 1818; and went in the same capacity to Spain in 1825. Four years afterwards, he returned to the United States, where he became proprietor and editor of *The North American Review* (1830—1835), and also occupied a seat in the legislature of Massachusetts. In the winter of 1840, he resided, as a confidential agent of the United States government, in the island of Cuba. He sailed for China as minister-plenipotentiary for that empire in 1845, and died at Canton, June 28, 1847. E. was a man of great versatility of talent and of extensive erudition. Politics and belles-lettres, political economy and poetry, statistics and æsthetics, alternately engaged his thoughts and pen. His writings are—*Europe, or a General Survey of the Political Situation of the Principal Powers*, &c. (London and Boston, 1822); *New Ideas on Population*, &c. (London and Boston, 1822); *America, or a General Survey of the Political Situation of the several Powers of the Western Continent*, &c. (Phila. 1827), in which he labours to shew that Russia and the United States must in the long-run share the continent between them; *Critical and Miscellaneous Essays* (two series, Boston, 1845 and 1847). These are on a vast variety of subjects, and are probably the most interesting productions of his pen. E. also published a volume of poems in 1845.

EVERETT, EDWARD, a younger brother of the preceding, was born in 1794 at Dorchester, near Boston, Massachusetts, entered Harvard College in 1807, and took his degree in 1811. He was for some time a Unitarian clergyman in the town of Cambridge, and in this capacity had the reputation of being one of the most eloquent and pathetic preachers in the United States. In 1815, he was elected professor of the Greek Language and Literature in Harvard College; and to qualify himself more thoroughly for his work, he visited Europe, where he resided for four years, and had a distinguished circle of acquaintance, including Scott, Byron, Jeffrey, Romilly, Davy, &c. M. Cousin, the French philosopher and translator of Plato, pronounced him 'one of the best Grecians he ever knew.' In 1820, E. became editor of *The North American Review;* and in 1824, a member of the United States Congress, sitting in the House of Representatives for ten years. In 1835, he was appointed governor of Massachusetts; and in 1841, minister plenipotentiary to the court of St James's. While in England, he received from the universities of Oxford, Cambridge, and Dublin the degree of D.C.L. On his return to America in 1845, he was elected president of Harvard College; on the decease of Daniel Webster, he became secretary of state; and in 1853, the legislature of Massachusetts chose him as a member of the senate of the United States. He died Jan. 1864.

E.'s principal works are: *A Defence of Christianity* (1814); *Orations and Speeches on Various Occasions from* 1825 *to* 1836 (1836); and *Orations and Speeches on Various Occasions from* 1825 *to* 1850. This includes all the previous orations. These *Orations*, as they are called, are upon all subjects, and, like the writings of his brother, indicate a varied, vigorous, and flexible genius.

E'VERGREENS are those trees and shrubs of which the leaves do not fall off in autumn, but retain their freshness and verdure throughout the winter, and perform their functions during more than one season. Evergreen leaves are generally of thicker and firmer texture than the leaves of deciduous trees and shrubs. They have also fewer pores or *Stomata* (q. v.), and these confined to their under surface. Evergreen leaves are sometimes very small, as in firs and heaths; sometimes pretty large, as in rhododendrons, laurels, magnolias, &c. E., both trees and shrubs, have always been much sought after by the landscape gardener, and for purposes of ornament and shelter. Some orders of plants consist exclusively, or nearly so, of E., whilst in others they exist only as exceptional species. Most of the *Coniferæ* are E.; and the sombre green of pines, firs, cypresses, &c., is a prevalent characteristic of northern scenery both in summer and winter; whilst the undiminished thickness of the foliage affords winter shelter to animals which could not so well exist in forests composed merely of deciduous trees. Holly and ivy are amongst the finest British E.; the box, privet, and different kinds of bay and laurel, rhododendron, phyllirea, myrtle, &c., are also familiar to every one. As instances of genera in which some species are evergreen and others deciduous, may be mentioned barberry and cytisus. Many fine new ornamental E. have recently been introduced. As suitable for imparting a lively appearance, boughs of E. are largely employed in Great Britain to decorate the walls of public places of assemblage, triumphal arches, &c., on festive occasions.

EVERLA'STING FLOWER, the popular name of certain plants, the flowers of which suffer little change of appearance in drying, and may be kept for years without much diminution of beauty. They are plants of the order *Compositæ*, having their flowers (heads of flowers) surrounded with an involucre; the scales of which resemble the petals of a corolla, but are rigid, membranous, and contain little moisture. Some species of Cudweed (q. v.) (*Gnaphalium*) are often called E. F., and the other plants which bear the name belong to nearly allied genera, but particularly to the genus *Helichrysum*, which contains a great number of species, mostly natives of Africa. *H. arenarium* is frequent on dry sandy soils in many parts of Europe and the central latitudes of Asia. It is covered with a gray felted down, and has yellow flowers, which, when rubbed, emit a faint aromatic odour. It is often worn on the continent of Europe as an ornament in the hat, particularly by wagoners. *H. angustifolium* and *H. Stæchas*—shrubby species, natives of the south of Europe—have larger yellow flowers. Some of the species have a powerful and pleasant aromatic odour. No species of *Helichrysum* is a native of Britain. Several kinds of E. F. are frequently to be seen in our gardens, others in greenhouses. The French call them *Immortelles*, and in France they are often woven into circular wreaths, and placed beside recent graves, as emblems of immortality.

E'VERSLEY, VISCOUNT, ex-Speaker of the House of Commons. CHARLES SHAW LEFEVRE, born in 1794, is descended maternally from the Lefevres, who came to England from Rouen on the revocation of the Edict of Nantes. He was educated at Winchester and Trinity College, Cambridge, called to the bar at Lincoln's Inn in 1819, entered parliament in 1830 as member for Downton, and represented Hants from 1831 to 1857. In 1839 he was chosen Speaker of the House of Commons; and re-elected in the parliaments of 1841, 1847, and 1852. He retired from the office in 1857, with a peerage and a pension of £4000 a year. During the eighteen years of his Speakership, he suggested and carried out many improvements in the forms and procedure of the Lower House, tending to the dispatch of business. Tall, and dignified in person, affable and accessible to the younger members, to whom he was ever ready to impart the results of his knowledge and experience, profoundly versed in the laws of debate and practice of the House, he was admirably qualified, by nature and training, to enjoy the distinction of 'first commoner of England,' and to preside over the greatest deliberative assembly in the world. His impartiality was never questioned, and his retirement from the Lower House was universally regretted. He was appointed governor and captain of the Isle of Wight, and governor of Carisbrooke Castle in October 1857.

E'VESHAM, originally Eovesham, a municipal and parliamentary borough in the south-east of Worcestershire, on the right bank of the navigable Avon, 15 miles south-east of Worcester. It lies in a beautiful and fertile vale, in which are many market-gardens and orchards. It has some manufactures of agricultural implements. Pop. (1861) 4680. It sends two members to parliament. An abbey was founded here about 700; and there still exists a bell-tower, 28 feet square at the base, and 110 feet high, erected by Bishop Lichfield immediately before the Reformation. Here Prince Edward, afterwards Edward I., defeated Simon Montfort, Earl of Leicester, in 1265.

EVI'CTION, in the law of Scotland, is the dispossessing one of property, whether in land or movables, in virtue of a preferable title in the person of him by whom the eviction is made. The same expression is used in England as to property in land; but where the tenant is merely deprived of possession, it is called Ouster.

E'VIDENCE, Legal. Evidence is either parole or written, the former consisting of the statements of witnesses appearing personally in court, and which statements must be attested by an oath or solemn declaration; the latter consisting of records, deeds, and other writings.

The tendency, both in England and Scotland, of late years, has been to abolish all restrictions on the admissibility of witnesses, and to bring the rule practically to what Blackstone stated it to be in theory, viz., 'all witnesses that have the use of their reason are to be received and examined.' The ground on which witnesses were formerly excluded was untrustworthiness, arising either from the character of the witnesses or their interest in the suit. Under the former head fell those who were legally Infamous (q. v.); whilst the latter included, first, the party to the suit himself, and then all who were connected with him by the ties of family, or even of business, in any appreciable degree. Gradually, however, it came to be seen that, though witnesses subject to these objections were less valuable than others to the party adducing them, it by no means followed that their testimony was of no value at all, and that the safer course in all cases was to examine them, and then to allow their testimony to be invalidated by proof of their interest in the cause direct or indirect, or of their having been convicted of such crimes as to render it unlikely that they should speak the truth. The objections have thus become objections not to the admissibility or competency, but to the credibility of witnesses. The first of the very important statutes by which these changes were effected was 9 Geo. IV. c. 32, which permitted Quakers and Moravians to substitute a solemn affirmation for an oath; admitted the party whose name had been forged as a witness in prosecutions for forgery; and provided that no misdemeanour (except perjury) shall render a party an incompetent witness after he has undergone the punishment. Then came the Scotch Act 3 and 4 Vict. c. 59, afterwards referred to, and the English Act 6 and 7 Vict. c. 85, which provided that no person offered as a witness shall hereafter be excluded, by reason of incapacity from crime or interest, from giving evidence either in person or by deposition on any issue or inquiry civil or criminal, but shall be admitted notwithstanding he may have an interest in the matter in question, or in the event of the trial or proceeding, and notwithstanding that he may have been previously convicted of any crime or offence. The same principle was extended by 14 and 15 Vict. c. 99 to the parties to a cause, who are not only competent, but compellable to give evidence on behalf of either or any of the parties—subject only to exception where the question tends to criminate the person examined, or where it is put in any action for breach of promise of marriage, or any action or proceeding instituted in consequence of adultery. By 16 and 17 Vict. c. 83, the former stat. 14 and 15 Vict. c. 99, was amended to the effect, that the husband or wife of the party shall be in the same position with the party himself—subject only to these exceptions, first, that the husband or wife cannot give evidence for or against each other in criminal proceedings, or proceedings in consequence of adultery, and that they cannot be compelled to disclose matters which they have learned by communications from each other during the marriage. The statutes by which the corresponding changes were effected in Scotland were 3 and 4 Vict. c. 59, 15 and 16 Vict. c. 27, and 16 and 17 Vict. c. 20.

The Oath (q. v.) to 'speak the truth, the whole truth, and nothing but the truth,' is administered to witnesses in England on the New Testament, in Scotland, holding up the right hand. Quakers and members of other denominations who object to the use of an oath, as formerly observed, emit a solemn Affirmation (q. v.); and persons who are not Christians are sworn, or otherwise bound over to speak the truth by such forms as are conceived to be appropriate to their respective creeds. The test of the amount of religious belief which will suffice to render a witness admissible, has been generally considered to be a belief in future rewards and punishments; but there is no decision which fixes the point, and in England, belief in a God whose rewards and punishments extend only to this life is considered sufficient (Starkie, 4th ed. p. 116; Dickson, p. 849). There seems reason to think, however, that this restriction is removed by 1 and 2 Vict. c. 105, which provides that all persons shall be bound by the oath administered in the form and with such ceremonies as such persons shall declare to be binding.

It is a general rule of the law of evidence, that a witness is not bound to criminate himself, and he may consequently decline to answer any question that tends to expose him to punishment as a criminal, or to penal liability, or to forfeiture of any kind. If the effect of the question be merely to establish that he owes a debt, or is otherwise subject to a civil suit, the exception will not hold, and he will be bound to answer it (46 Geo. III. c. 37). The rule in England is, that a counsel, attorney, or solicitor is not bound, or even entitled, to divulge the secrets of the cause with which he has been intrusted; and the recent Scottish Act 15 and 16 Vict. c. 27, s. 1, preserves the same exception with reference to agents who shall at the time when so adduced be acting in that capacity. Neither can official persons be called upon to disclose matters of state, the publication of which might be prejudicial to the community. All other professional persons, however—lawyers not engaged in the cause, physicians, surgeons, and divines, must divulge all secrets relevant to the issue with which they have become acquainted, even in the strictest professional confidence. See CONFESSIONAL. Neither will a servant nor private friend be allowed to withhold a relevant act, though of the most delicate nature.

One witness in England is sufficient in law, if the jury are willing to accept a fact on his testimony, and in long chains of evidence it is often impossible that more than one witness should be adduced to make out some of the links of it. In general, however, there will be some fact or circumstance which will act as a supplementary adminicle, if the testimony be reliable; and it is this fact which has rendered the practical effect of the opposite rule, which demands two witnesses, in Scotland, not very different. The want of a second witness is usually supplied by a witness to circumstances which are corroborative of the evidence of the first; and where the one witness is not so corroborated in England, he will rarely be believed. It is a rule that none but the best evidence shall be adduced, which means that secondary shall not be substituted for primary evidence where the latter is accessible; a rule founded on the presumption that such a substitution is probably prompted by a sinister motive. This rule applies to written as well as oral testimony, and excludes copies of documents, just as it excludes the 'hearsay' of witnesses. See OATH, JURY, WITNESS, DEED, TESTING, &c. The best works on evidence in English are Starkie (English), Greenleaf (American), and Dickson (Scotch).

E'VIL may be generally defined as that which is opposed to the divine order of the universe. It requires only a superficial observation to perceive, that there are many apparent exceptions to the pervading harmony and happiness of creation: there are convulsions in the physical world; there are suffering, decay, and death throughout the whole range of organic existence; and the appellation of evil is commonly applied to such phenomena. In the face of the human consciousness, such phenomena appear to be infractions of the general order and good, and it pronounces them *evil.* How far the internal feeling of wrong has been quickened and educated by such outward facts, it would be difficult to say, but, beyond doubt, they have exercised upon it a powerful influence. Every form of religion testifies to the recognition of evil in the external world, and superstition in all its shapes mainly rests upon it.

But it is in the sphere of moral life alone that the conception of evil can be said to hold good. After the light of science has explored the secrets of nature, and shewn how all its apparent anomalies are merely manifestations of a comprehensive harmony, the idea of evil is dispelled from the material and merely organic creation. 'Whatever is, is best,' is seen to be everywhere the law of this creation. There remains, however, the ineradicable feeling of evil in human life and manners and history. There is in the moral consciousness of man a sense of violated order, of transgression of divine law, or what is called *sin,* which is *evil* in its essential form. This fact of evil is everywhere appealed to by the Christian religion; it is the aim of this religion to deliver men from its power and misery. Every ethical and judicial code is based upon its recognition, and is designed to protect human society from its injurious consequences. It cannot be better or more clearly defined than in the language already given, viz., the transgression of the divine law revealed in conscience and in Scripture.

The question of the *origin of evil* has been greatly discussed, and received various answers. The simplest and most direct of these answers is that which maintains a double origin of things, or a system of *dualism.* This conception lies at the bases of many forms of religion; it may be said to be the fundamental conception of all mere nature-religions. Interpreting the obvious appearances of nature, they embody in divine personalities its contending manifestations of light and darkness, benignity and terror. The opposition of Ormuzd and Ahriman in the old Zoroastrian faith is one of the most conspicuous examples of this religious dualism. Manicheism, which spread so widely in the 4th and 5th centuries, and the Syrian gnosticism from which it sprung, are also historical illustrations of the same principle.

The dualistic theory of the origin of evil, however, could not obviously maintain itself with the advance of speculation and the spread of Christian truth. It was no less clearly a postulate of the cultivated reason than a dictate of divine revelation, that the world proceeded from One absolutely Divine Creator, holy and good, of whom, and through whom, and to whom are all things. It was necessary, therefore, to reconcile the appearance of evil with this fundamental admission.

The doctrine of the Fall, especially in the later form of development which connects it with the existence of a devil or evil spirit, tempting man in the shape of the serpent, was supposed to explain the appearance of evil in human history. Being tempted of the devil, man sinned, and so fell from his obedience to the divine law. This is the doctrine of orthodox Christian theology, and the answer which it gives to the inquiry, how sin came into the world? And many minds never think of carrying the inquiry further. It is clear, however, that this explanation of the historical origin of evil leaves the question of its real and absolute origin unsettled. The devil being assumed as the cause of man's sin, the further question arises, whence the devil? Is he an absolute personality? in which case we are landed in the old theory of dualism; or is he, according to the traditionary Christian conception, a fallen angel? in which case the question just returns, whence the spring of evil in him? There is no real explanation gained by this removal of the question; it is still the same difficulty—whence the origin of evil in the creation of an all-perfect being, almighty as well as all-wise and good?

Speculation may please itself with ingenious answers to this question, but in truth it admits of no satisfactory solution. Some, for example, have argued that evil, like darkness or cold, is an indispensable element of alternation or contrast in human life. All individual reality is only the product of opposite forces working together. Character could only arise from the interaction of opposing ethical influences of good and evil. In nature, we have attraction and repulsion, rest and motion, positive and negative electricity; why should it be different in the sphere of morals? Here, too, there must be polarity. Good can only exist in contradistinction to evil; the one no less than the other is necessary to constitute the drama of human life and history. Others, again, have argued, that evil is the result of what is called metaphysical imperfection. God alone can be perfectly good. The creature, in its very nature, is limited, defective; and evil is nothing else than the evidence of this limitation in man. It is not something real or positive, but only a privation. It is in morals what cold and darkness are in physics, a pure negation. Thus have argued such profound thinkers as Augustine and Leibnitz. But it requires but little penetration to see that such arguments, however ingenious, and so far well founded, do not meet the essential difficulty of the problem. If evil be, according to such views, a necessary element of human life, in the one case, in order to develop its activity, in the other case, as clinging to its creaturely limitations, then plainly it is not, in the orthodox sense of the word, *evil.* It is not, and cannot be a contradiction of the true idea of human life, and at the same time a necessary element of it. Whatever necessarily belongs to life, must help its true development, and not injure and destroy it; must be *good,* in short, and not *evil.* Such theories, therefore, only solve the problem by eliminating the fact. The origin of evil must remain for ever inscrutable; nor is it wonderful that it should. It is only in its ultimate sense conceivable as a quality of moral freedom, and moral freedom in man or any created being is a profound mystery. It is something which 'we apprehend, but which we can neither comprehend nor communicate.'

EVIL, KING'S. See KING'S EVIL.

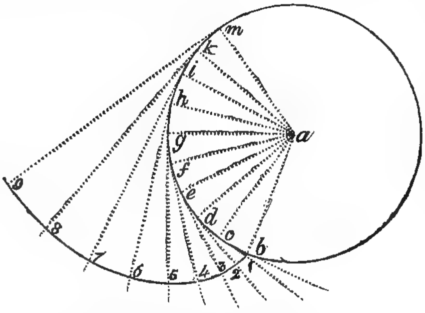
EVIL EYE. Both in ancient and modern times, the belief that some persons have the power of injuring others by looking upon them, has been widely diffused. The Greeks frequently speak of the *Ophthalmos Baskanos* (or evil eye), which they conceived to be specially dangerous to children; and the Romans used the verb *fascinare* to express the same fact. Pliny speaks—not on his own authority, however—of 'those among the Triballians and Illyrians, who with their very eyesight can witch (*effascinent*), yea, and kill those whom they look wistly upon any long time;' and Plutarch states, on the authority of Philaretus, that 'the Thybiens who inhabited Pontus were deadly, not only to babes, but to men grown, and that whomsoever their eye, speech, or breath would reach, were sure to fall sick, and pine away.' Menalcas, in Virgil (*Ecl.* iii. 102), also complains that some evil eye has fascinated his young lambs—

> Nescio quis teneros oculus mihi fascinat agnos.

The principal amulet used by the ancients was the *phallus* or *fascinum,* as the Romans called it, which was hung round the neck of children. Of course, this superstition, like all others, flourished in Europe during the middle ages. See Reginald Scot's *Discovery of Witchcraft;* the *Opusculum de Fascino* of John Lazarus Gutierrez, a Spanish physician, published in 1653; and the *Tractatus de Fascinatione* of John Christian Frommann, a physician of Saxe-Coburg, published in 1675. In the British Isles, also, the belief in the power of the evil eye is of old date, and is by no means dead, at least in Ireland and the Highlands of Scotland. In these countries (as elsewhere), it was once a very common superstition that cattle were subject to injury in this way. Witches had the power to a malignant degree; and various charms, such as twining mountain-ash among the hair of the cow's tail, were used to avert or destroy their noxious influence. In the East it was and is no less prevalent. The Persians have various methods of discovering the special kind of fascination by which a person is afflicted; and Dallaway, in his *Account of Constantinople* (Lond. 1797), affirms that 'nothing can exceed the superstition of the Turks respecting the evil eye of an enemy or infidel. Passages from the Koran are painted on the outside of the houses, globes of glass are suspended from the ceiling, and a part of the superfluous caparison of their horses is designed to attract attention, and divert a sinister influence.' Hobhouse, in his Travels, bears equally conclusive testimony to the prevalence of this superstition in the Turkish empire, not among Mohammedans only, but also among Christians; while Lane, in his *Modern Egyptians* (1836), gives an account of the precautions taken by the Egyptians to avoid the influence of evil eye. The American Indians partake of the same belief; and it is not improbable that if the matter were still more profoundly investigated, it would be found that every nation that exists or has existed, with anything like a developed system of superstition, believes or has believed in the reality of fascination in some form or other.

The universality of this superstition goes far to prove that it has what may be called a *natural* origin; and, indeed, when we consider that the *eye* is the most expressive organ of the soul or mind of man, that through it are shot forth, as it were, into the visible world of the senses, the hidden passions, emotions, and desires of our nature, we will not wonder that in the 'times of ignorance,' when men could give no rational or scientific account of almost any physiological phenomena, if connected with psychology, the eye should have been superstitiously imagined to be a centre of malignant influence. The eye is, in point of fact, as potent as superstition dreams: the error lay not in the recognition of its power, but in explaining the mode of its operation. The person who felt himself under the spell of a powerful gaze, was too agitated to calmly consider the cause of his terrors, and attributed to another results for which he himself was mainly responsible. It was really he that gave to the eye of his fellow-creature its baleful influence; and he quailed less before the force of character which it indicated, than before the fearful fancies with which his own timidity had invested it. For this disease, wherever it has existed, or does yet exist, there is no cure but that solid culture of the understanding from which comes a true strength of will and brain. See FASCINATION IN SERPENTS.

E'VOLUTE AND **I'NVOLUTE.** See CURVATURE and OSCULATING CIRCLE. The evolute of any curve is the locus of the centre of its osculating circle, and relative to its evolute, the curve is called the involute. This is the simplest definition that can be given of an evolute and involute, which are relative terms. There is another, however, which may represent the relation of the curves more clearly to those who are not mathematicians. If on any curve a string be closely wrapped, and if the string be fastened at one of its ends, and free at the other; and then if we unwind the string from the curve, keeping it constantly stretched, the curve which would be traced out by a pencil fixed to the free end of the string, is called the involute of that from which the string is unwound, and relative to it, the latter is called the evolute. It is clear that the involute might otherwise be described by fastening a string at one extremity of the evolute, and wrapping it thereupon, keeping it always stretched. From either definition, it is clear that a normal to the involute at any point is a tangent to the evolute, and that the difference in length between any two radii of curvature to the involute is equal to the length of the arc of the evolute intercepted between them. The nature of evolutes was first considered by Huyghens, who shewed that the evolute to a common cycloid is another equal cycloid, a property of that curve which he employed in making a pendulum vibrate in a cycloid. To describe the involute of a circle, proceed as follows: Let a be the centre of the circle, and b the extremity of the string to be unwound from its circumference. Divide the circle, or part of the circle, according to the length of curve required, into any number of equal parts, as c, d, e, &c.; through these, from a, draw radial lines; from the points where these touch the circle, draw, at right angles to the lines ac, ad, &c., other lines, as in the diagram. With the distance cb as radius, from the point c, describe an arc $b1$, cutting the line $c1$ in 1. From the point d, with $d1$, describe an arc 1 2, cutting the line $d2$ in 2. From e, with $e2$, describe an arc 2 3, cutting the line $e3$ in 3. With radius $f3$, from f, describe an arc 3 4, cutting $f4$ in the point 4. Proceed in this way, describing arcs which pass through the points 5, 6, 7, 8, and 9. The involute will thus be formed.



EVOLU'TION AND INVOLU'TION, algebraical terms, the former signifying *the extraction of roots*, and the latter *the raising to powers*. When any number is multiplied by itself, the product is called its square, or second power. If we multiply the square by the number again, we get the cube, or third power; and so on. This process is called involution. Evolution is the inverse process, by which a number being presented, we may ascertain a particular *root* of it, say the fourth; or that number which, being multiplied into unity a particular number of times, say four times, the product will be the number presented. Both subjects will be found treated in all algebraical text-books. Evolution is more particularly considered under the head EXTRACTION OF ROOTS.

EVOLU'TIONS, in military matters, are the movements of troops in order to change position. The object may be to maintain or sustain a post, to occupy a new post, to improve an attack, or to improve a defence. All such movements as marching, counter-marching, route-marching, changing front, forming line, facing, wheeling, making column or line, making échelon or square, defiling, deploying, &c., come under the general heading of evolutions. More minute descriptions of these and other motions will be given under TACTICS, MILITARY AND NAVAL. Other things being equal, the best evolutions are those which occupy least time and least space. The word evolution equally applies to the movement of ships in a fleet.

E'VORA (ancient *Ebora*), a city of Portugal, capital of the province of Alemtejo, and, after Coimbra, and perhaps Thomar, the most interesting city in the country, is beautifully situated on a fertile and elevated plain, 48 miles west-south-west of Badajoz, and about 80 miles east of Lisbon. It was once a place of considerable strength; but its ramparts, and the towers which flanked them, its citadel, its forts, and its watch-towers, are now in a hopelessly ruinous condition. The town itself is not well built, its streets are narrow and winding, and its houses old and badly planned. It has a cathedral, a large Gothic edifice, founded in 1186, the choir of which, rebuilt in 1721, is in the Italian style, and is richly adorned with marbles of various colours. E. has been the see of an archbishop since 1541; has an archiepiscopal library, containing upwards of 50,000 volumes; and several pictures of great merit, attributed to Gran Vasco. It has manufactures of ironware and leather, and a well-attended annual fair. Pop. about 12,000.

E. is a very ancient city. Quintus Sertorius took it in 80 B.C. It was also conquered by the Moors in 712, but recovered from them in 1166. The Roman antiquities of E. are unrivalled in the Peninsula. Among these, the temple of Diana, used as a slaughter-house for some time previous to the year 1834, exhibits in its fine Corinthian columns admirable proportion and delicacy of sculpture. There is also an aqueduct, 1200 paces in length, erected by Quintus Sertorius; but the most beautiful Roman relic, and one of the most perfect pieces of ancient architecture in existence, is the tower which rises in the city at the extremity of the aqueduct. It is 12 feet 6 inches in diameter, and is surrounded by eight columns of the Ionic order. Ionic pilasters decorate the second story, and the top is crowned with a hemispherical dome. It is wholly constructed of brick, and covered with cement of such a durable nature, that, although this delicate structure has existed since 70 B.C., few parts of it seem to have been impaired by time.

EVREMOND, CHARLES MARGOTELLE DE ST DENIS, SEIGNEUR DE ST, an author and wit of the 17th c., was born at St Denis-le-Guast, in Normandy, April 1, 1613. He entered the army about the age of 15, became an ensign in less than a year, and in 1637 had the command of a company of foot. About this time, he gained the favour and friendship of Turenne, Grammont, the Prince of Condé, and others of high rank, all of whom were delighted with the wit and cheerfulness of his conversation. Having talked himself into the esteem of these men, it was not long, however, until, by the same means, he brought himself under their displeasure. In 1661 his unbridled indulgence in raillery compelled him to take refuge in England. Many attempts were made at the French court to induce Louis XIV. to recall St E., whose accomplishments, gaiety, and wit rendered him the delight of all who had not smarted from his sarcasm, but Louis remained immovable, until 1689, when he granted the exile permission to return. It was now, however, too late. St E. had by this time surrounded himself with an admiring circle of the wits and beauties of the English court, and resolved to remain where he was. He died in his 91st year, in September 1703.

St E.'s works, comprising comedies, classical essays, &c., were first correctly published by Des Maizeaux, with a life of the author (Lond. 1705). The works are also translated into English by the same editor.

EVREUX (anciently *Mediolanum*, and more recently *Eburovices*), an episcopal city of France, in the department of Eure, of which it is the capital, is pleasantly situated in a valley on the Iton, a feeder of the Eure, 60 miles west-north-west of Paris. It is well built, its streets regular, and the environs prettily laid out in promenades, gardens, and vineyards. The principal building of E. is the cathedral, which dates from the 11th century. The other buildings of note are the abbey church of St Thaurin, originally built over the tomb of St Thaurin, the first bishop of E., and having a shrine executed in the 13th c., which once contained his relics; the Bishop's Palace, built in 1484; and the *Tour de l'Horloge* of the same century. E. has extensive manufactures of bed-ticking, woollen stuffs, cotton-yarn, leather, vinegar, and a trade in its manufactures, and in grain, seeds, timber, and liqueurs. Pop. 12,877.

E. is remarkable for the numerous sieges which it has sustained. It was taken by Clovis from the Romans; was sacked and plundered in 892 by the Northmen, under Rollo; was burned by Henry I. of

England in 1119; and in 1194 and 1199 it was twice captured by Philippe Auguste, king of France, into whose hands, after a short time, it permanently came. It was frequently taken and recovered in the wars between France and England during the reigns of Henry V. and Henry VI. of the latter country.

VIEIL EVREUX (*Old Evreux*), a village near E., and the supposed site of the ancient Mediolanum, has some ancient remains of a theatre, an aqueduct, and fortifications.

EWALD, GEORG HEINRICH AUGUST VON, one of the greatest living Orientalists, was born 16th November 1803, at Göttingen, and exhibited a predilection for Oriental literature even in his school-days. He studied at the university of his native place, and while still a student, wrote a work on the Composition of Genesis (*Die Composition der Genesis*, Braunschw. 1823). In 1823, he became a teacher at the Wolfenbüttel gymnasium; in 1827, extraordinary, and in 1831, ordinary, professor of philosophy at Göttingen; and in 1835, was appointed nominal professor of the Oriental languages. Travels in search of Oriental MSS. led him, in 1826, 1829, and 1836, to Berlin, Paris, and Italy. After the death of Eichhorn, the critical exegesis of the Old Testament was included in his duties as professor of the Oriental tongues. The first, and perhaps the most important fruit of his new labours, was his Critical Grammar of the Hebrew Language (*Kritische Grammatik der Hebr. Sprache*, Leip. 1827), an abridgment of which was published at Leipsic in 1835, under the title of Grammar of the Hebrew Language (*Grammatik der Hebr. Sprache;* 5th edit. 1844); and a still simpler epitome in 1842, entitled Hebrew Grammar for Beginners (*Hebr. Sprachlehre für Anfänger*). Before this, however, E. had acquired a high reputation by his work on Canticles (*Hohe Lied Salomo's*, Gött. 1826); his Commentary on the Apocalypse (*Commentarius in Apocalypsin*, Leip. 1828); his Poetical Books of the Old Testament, in 4 vols. (*Die Poetischen Bücher des Alten Bundes*, Gött. 1835—1837); and his Prophets of the Old Testament, in 2 vols. (*Die Propheten des Alten Bundes*, 2 Bde. Stutt. 1840). Between the years 1843—1850, E. published at Göttingen an important work in 4 vols., on the History of the People of Israel until the Time of Christ (*Geschichte des Volkes Israel bis auf Christus*), and a subsidiary volume on the Antiquities of the People of Israel (*Die Alterthümer des Volkes Israel*). The *Geschichte des Volkes Israel*, together with its two continuations, The History of Christ and his Time (*Geschichte Christus und seiner Zeit*, 1857), and The History of the Apostolic Age, &c. (*Geschichte des Apostolischen Zeitalters bis zur Zerstörung Jerusalems*, 1858), is regarded as E.'s greatest work. But Jewish history and literature did not limit the sphere of E.'s wonderful activity. His lectures at Göttingen embraced the literature of the Arabic, Persian, Aramaic, and Sanscrit tongues, and gave birth to such works as that on the Metres of the Arabian Songs (*De Metris Carminum Arabicorum*, Leip. 1825); on Some of the Older Sanscrit Metres (*Ueber einige ältere Sanscrit-Metra*, Gött. 1827), an epitome of the Arabic author Wakidi's work on Mesopotamia (*De Mesopotamiæ expugnatæ Historia*, Gött. 1827), and a Grammar of Arabic, entitled *Grammatica Critica Linguæ Arabicæ cum brevi Metrorum Doctrina*, 2 Bde. (Leip. 1831—1833). In 1832, E. published at Göttingen several very important Dissertations on Oriental and Biblical Literature (*Abhandlungen zur orient. und biblischen Literatur*), and planned the well-known periodical, Journal for the Knowledge of the East (*Zeitschrift für die Kunde des Morgenlands*). E., however, is not only a scholar and philologist, but a man of strong political convictions. Having, along with six of his colleagues (the others were the brothers Grimm, Dahlmann, Gervinus, Weber, and Albrecht), protested against the abolition of constitutional law and liberty in Hanover by the new sovereign, Ernest Augustus (previously Duke of Cumberland), he was dismissed from his situation, 12th December 1837, and went to England to investigate its public libraries, whence he was called to Tübingen in 1838, as professor of theology. Here he remained for ten years, and, partly on account of the catholicity of his views, and the imperiousness of his temper, was involved in many strifes. In 1841, he was ennobled by the king of Würtemburg. In 1848, E. returned to Göttingen, where he established a Year-book of Biblical Science (*Jahrbuch der biblischen Wissenschaft*), in which, as well as in his work on the Synoptic Gospels (*Die drei ersten Evangelien*, Gött. 1850), and works on the Epistles of Paul (*Die Sendschreiben des Apostels Paulus übersetzt und erklärt*, Gött. 1857), he has striven to give a firmer basis to New Testament criticism and exegesis. Recently, also, E. has paid great attention to Ethiopic literature, a result of which is his valuable Dissertation on the Book of Enoch (*Uber des Æthiopischen Buches Henoch Entstehung*, &c., Gött. 1856). The distinguishing peculiarity of E. as a theologian and critic, is his love for the concrete forms in which divine truths are revealed in history, and his dislike of the abstractions into which they are refined away by over-speculative theologians. He regards it as the especial glory of the Jewish people, that they never lost sight of the concrete, as the Persians and Hindus, for example, did, with whom the realities of religion vanished into the most intangible dreams, but kept it ever before them until, in the fulness of times, there was born in their midst Jesus of Nazareth, the Perfect and Only One, in whom humanity reached its spiritual consummation. E.'s position in the variegated field of German theology is not easy to define. He refuses to class himself or to be classed with any party. He is equally opposed to the extreme left represented in Tübingen, and to the extreme right represented in the modern Lutheran movement headed by Hengstenberg. It cannot be expected that E. could form a party, when he at times denounces, with an eloquence unequalled in any theological chair in Germany, the 'heathenism' of Lutherans, Romanists, and Rationalists.

EWALD, JOHANNES, one of the best lyric poets of Denmark, was born at Copenhagen on the 18th November 1743, and died in the same city in 1781, after a life of checkered adventure, trouble, and privation. At the age of 11, on the death of his father, E. was admitted into the Slesvig College. In his 16th year, when his friends were about to send him to the university of Copenhagen, the restless impatience of restraint which had always characterised him, led him to make his escape to Germany, where he entered as a private soldier in the army of Frederick the Great of Prussia, from which he soon deserted to the Austrians. His bravery having attracted the notice of his superiors, he was offered a commission, but this he refused to accept, as it would have obliged him to become a Catholic; and having induced his friends to purchase his discharge, he returned to Copenhagen in 1760, after having taken part in the great campaigns of 1759—1760. He now began the study of theology, but a disappointment in love drove him to abandon it, and give his attention solely to poetry. The first production of E. which attracted general notice, was the funeral ode which he wrote on the death of Frederick V. of Denmark in 1767, and which exhibited so much original genius, that it at once raised the young poet to the rank of one of the best writers of his country. This successful attempt was rapidly followed by the appearance of numerous tragedies, operas, and songs, which are remarkable for great lyrical beauty. In 1770, appeared the prose tragedy of *Rolf Krage*, which gives evidence of a careful study of Shakspeare and the English dramatists of the Elizabethan age. Although *Balder's Doed* (1773), which breathes the heroic spirit of the ancient bards of the north, and exhibits the specially national tendency of E.'s genius, is regarded by some critics as his *chef-d'œuvre*, *Fiskerne*, 'The Fishermen' (1780), probably deserves to rank equally high, when considered as a mere lyrical production. His habits of dissipation, and the decided opinions which he expressed in reference to politics, brought him into difficulties of every kind, while his infirmities of temper, and irregularities of conduct, estranged the affection of his nearest relatives, and in the latter years of his unhappy life he was often indebted to the charity of strangers for the means of subsistence. Some of his nautical songs have been raised to the dignity of national odes, and many of his occasional pieces rank among the sweetest poems of his country. He was engaged at the time of his death in compiling an autobiography, and in bringing out the complete edition of his writings, which finally appeared in 1792. His works have also been edited by F. L. Liebenberg (Copen. 1850—1855); and a life of E., compiled from hitherto unpublished materials, has recently appeared from the pen of F. C. Olsen, of Copenhagen.

EXAMINATION OF A BANKRUPT. See Bankruptcy.

EXAMINATION OF A PRISONER, in Scotland. See Declaration.

EXAMINATION OF A WITNESS. See Evidence.

EXAMINATIONS FOR THE PUBLIC SERVICE. Up to the year 1855, all the junior appointments in the several branches of the Civil Service were made upon a system which was practically one of simple and unchecked nomination. Examinations nominally existed in a few of the departments, but they had degenerated into an unmeaning form. The departmental examiners, who were taken from other duties for this temporary purpose, and were closely connected with the particular department, were too much afraid of the clamour of individuals to be very stringent in their requirements, and keep up the standard of examination. In one important board, not a single candidate had been rejected for twelve years. The consequence was, that persons were often appointed who were objectionable on account of age, broken state of health, and bad character, as well as from want of proper intellectual qualifications.

Changes in the Civil Service have been made sometimes by the legislature, sometimes by the executive, but chiefly, as in the present instance, by the latter. Some years ago, a commission was appointed to consider plans for its entire reorganisation. This commission, which included the names of Sir Charles Trevelyan and Sir Stafford Northcote, made its report in 1853, and strongly recommended competitive examinations, as the mode of making the appointments in the first instance. In the following year, a plan for improving the system was promised in the Queen's speech, but nothing further was done. In May 1855, an order in council was issued, appointing the present Civil Service Commissioners, and defining their duties. This order is still in force, and directs the commissioners to examine into and certify the qualifications of young men nominated to junior situations in the Civil Service. Before granting the certificate, they are to ascertain the four following things: the age, health, character, and the knowledge and ability of the candidates. All the details as to each of these points—such as limits of age, and the subjects of examination—are settled at the discretion of the heads of the several departments; while the decision, on individual cases, rests solely with the commissioners.

As the nature of the requirements expected from the candidates depends on the heads of the several departments, considerable variety may be expected in the different branches of the service. As the system has not yet reached a settled state, the exact details of the examination for the various offices must be sought from time to time in the latest of the annual reports of the Civil Service Commissioners; but the following general account of its present state may be given here. Leaving out of account labourers and artisans, the persons employed in the public service may be divided into two great classes: the first including all those who may be called by the general name of clerks, and whose occupation is mainly of a sedentary, and more or less of an intellectual character; the other embracing all the inferior appointments—such as excise officers, tide-waiters, and letter-carriers, whose employments require in a special degree physical strength and activity. For the latter class, the examination is of a purely elementary character, and is for the most part confined to reading, writing, spelling, and arithmetic. The principle of competitive examinations has not been applied, and is not intended to be applied, to this class of public servants, but their health and moral qualifications are strictly investigated.

As to the first class, the system is still in a state of transition. It will be observed that the order of 1855 directs the commissioners to examine young men who have been *nominated*. Under this order, three varieties of examination are now in operation. The first is a simple test examination. When a vacancy occurs, a single person is nominated by the head of the department or other proper authority, and this person is afterwards submitted to examination. The second is a system of limited competition. When a vacancy occurs, several persons are nominated, and being submitted to examination, the appointment is obtained by the best of this limited number. The third is the system of open competition, which has been employed in the cases where the right of nomination has been wholly surrendered. A simple test examination seems to have been all that was contemplated in the order of 1855, but since that time there has been a steady advance towards competitive examinations. Resolutions have passed the House of Commons recognising the advantages of competition, and a parliamentary committee, appointed in 1859, has reported in favour of proceeding further in that direction. At present, the principle of open competition prevails in the Indian Civil Service, in the Medical Service and Public Works Department in India, and in the scientific branches of the Military Service. The principle of limited competition prevails in about three-fourths of the higher departments, while in the remainder of these, and in all the lower grades of the service, from tide-waiters downwards, there is a simple test examination.

The number of nominations to which the order in council has been applied from 1855 to the end of 1860 is 13,491. Of these, 9962 were nominations of one only, to whom, therefore, as explained above, a simple test examination was applied. The commissioners rejected 2289. Out of these 2289, all but

220 failed either in arithmetic or spelling; some, of course, in other subjects also. It may therefore be said that more than 2000 persons deficient in the ordinary rudiments of a good education have been nominated to the Civil Service in six years, and excluded by the examination. During the same period, about 600 of those nominated were ineligible on account of age, health, or character. In comparing the number of certificates granted with the number of rejections in each year, it appears that the proportion of the latter has diminished in the latter years.

Up to 1859, the far greater proportion of all appointments made under the new system has been made by nomination of a single person followed by a test examination. But the experience had in the working of the system has convinced the commissioners and the parliamentary committee of the wisdom of advancing in the direction of competition. The minimum standard is difficult to maintain. It causes delay and inconvenience by the rejection of candidates, and the necessity of providing others. The rejections throw unpleasant discredit on the patron, and if frequent, it is ascribed not to the unfitness of the candidates, but to the standard being fixed too high. The candidate is aggrieved at the loss of an appointment which he had looked on as his own, and the patron is likely to share the feeling. In the competitive system, these evils do not exist. The number of competitors will itself keep up the standard; the candidate is not rejected as unfit, but only gives way to one fitter; and the standard cannot be said to be fixed too high, for the fact of candidates coming forward shews that the prize is worth the trouble of attainment. On these grounds, the commissioners recommend the gradual introduction of open competitive examinations into all the departments of the service, but in the meantime think it a safer course to continue and extend the system of limited competition. Experience, however, has shewn that the latter is often a system of competition more in name than in reality, and that some conditions are requisite to make it effective. In 1859, 1107 persons were nominated to compete for 258 situations; of these, only 397 were competent, the remaining 710 being wholly unfit for any appointment. The real competition took place between 397 persons. The experience of 1860 confirms this view. In a competition for 42 clerkships at the Admiralty, of 66 candidates, only 24 were competent, being less than the number of situations; so that competition in that case would have given worse results than a simple test examination. With the view of rendering it more effective, the parliamentary committee of 1859 have recommended some modifications in the system, which the commissioners intend to carry out. In future, no candidate will be admitted to enter into the competition who has not previously passed the test of fitness; and the competition for each vacancy will take place among at least five of such qualified persons. The test examination will be mainly confined to writing, spelling, arithmetic, and making a *précis* of a given set of papers. It is at the same time further recommended that the experiment of open competition, as tried in the Indian Civil Service, be from time to time repeated in other departments.

The mode of making the appointments to the Civil Service has of late years been much discussed, and the permanent nature of the appointments makes the question one of much importance. The members of this service remaining in office through all political changes, and aiding each minister in turn by their knowledge of business and of official details, form, in fact, a class of *professional* public servants, entering their profession as others do while young, in the hope of rising gradually to its higher grades. It is admitted on all hands that these persons should not be liable to be turned out and thus deprived of the benefit of their previous service, except for positive misconduct; and since there is no way of getting rid of them except by making them pensioners on the public purse, it is clearly of the greatest importance that the appointments should be well made in the first instance.

It is said on the one hand, that, apart from an examination, there is no imaginable plan that can enable the head of a department, overworked as he often is, to acquire an intimate knowledge of the character, habits, and abilities of successive generations of young men; that even with this knowledge, and much more in its absence, there is much to be feared from partiality and private or political interest. The minister must depend on the recommendations of others, and will be obliged to comply with the importunities of friends and political supporters. These will naturally desire to serve their friends rather than the public, and their friends are best served by the advancement of their least competent children. Hence, there is good reason for supposing that the choice would be somewhat worse than if made blindfold from a ballot-box.

Though the new system has not yet been long enough in operation to give sufficient grounds from experience for pronouncing a strong opinion, the commissioners do not hesitate to declare in their latest report that competitive examinations, combined with proper conditions as to age, health, and character, and with the check of a period of probation, and with promotion by merit from class to class, is the best mode of providing for the public service.

The objections which have been urged on the other hand are mainly reducible to the two which follow. It is said, in the first place, that in competitive examinations too much credit is given to scholastic requirements which are not required for the service. To this it is replied, that persons being appointed in early life, not as having learned, but in order to learn, their profession, the only thing by which the best candidates can be discriminated is their proficiency in the ordinary branches of a liberal education; further, that due weight is always given to acquirements that are strictly practical—writing, arithmetic, spelling, English composition, and the power of framing a *précis* of a given set of papers, so that whatever be the scholastic requirements of the successful candidate, there is enough of the practical to qualify him for his office; and lastly, that examinations in language, literature, and science are extremely useful in ascertaining the relative ability, industry, and cultivation of the candidates, and that it is as affording evidence of these that they are principally regarded.

It is contended, in the second place, that there are very important moral qualities which are not taken into account in a competitive examination. This must be at once admitted, for although such qualities as perseverance and energy may to some extent be indicated by superiority of acquirements, there are others, such as judgment, discretion, fidelity, strength of will, regarding which no certain conclusions can be drawn. It has, however, been justly observed, that this class of qualities can be shewn only by conduct, and that the early age at which the appointments are made will have rarely afforded sufficient opportunities for giving proof of them; to which it may be added, that the previous conduct and disposition of candidates is rarely known to the head of the department or other authority who makes the appointment. If these qualities are not tested by competitive examinations, neither were they tested under the system previously in existence; and the objection, therefore, apparently amounts to this, that having the means of testing the intellectual qualities and acquirements of the candidate, we ought to abandon it because it does not include all the moral qualities, while at the same time there is no satisfactory mode of testing the latter.

It is obvious that whenever several persons apply for the same thing, there must be competition in one way or other: it will be either in the way of influence—in which case a person is selected not because he is the fitter man, but to gratify some one else—or by testimonials, which is not altogether satisfactory. The remaining plan is competition by examination. It is worthy of remark, that besides its other advantages, the latter gives an impetus to education through the whole country, stimulates exertion, and encourages habits of industry—habits which, once acquired, remain, and become applicable to the public service.

EXANTHE'MATA (from a Greek verb, to effloresce, or come out in a rash), a class of febrile diseases (see Fever) attended by distinctive eruptions on the skin, appearing at a definite period, and running a recognisable course. To this class belong small-pox, chicken-pox, measles, scarlet fever, and, according to some authorities, plague, typhus, erysipelas, &c.

E'XARCH was the title first conferred by Justinian on his commander-in-chief and vicegerent in Italy. The conquest of Italy by the Goths in the early part of the 6th c. was a severe blow to the Byzantine pride; and Justinian determined to wipe out the disgrace, and recover the imperial territories. The execution of this project was intrusted at first to Belisarius (q. v.), and afterwards to Narses (q. v.), by whom the reconquest of Italy was effected. The latter was the first who bore the title of exarch; and the district over which he ruled was called the *Exarchate*. The seat of the exarchs was Ravenna, the different towns and territories belonging to them being governed by subordinate rulers, styled *Duces* or Dukes. The extent of the exarchate, however, was gradually diminished, until it embraced only the country about Ravenna, the present Romagna, and the coasts of Rimini as far as Ancona. This was brought about partly by the conquests of the Longobards, partly by the dukes of Venice and Naples making themselves independent. In the year 728, even this small portion fell, for a short time, into the hands of the Longobards. In 752, Astulf, or Astolphus, king of the Longobards, put an end to the Byzantine rule at Ravenna; but in 755, he was compelled to resign the exarchate to Pepin the Less, king of the Franks, who gave it over to the Bishop of Rome, Stephanus II.—In the Christian Church, exarch was originally a title of the bishops, afterwards of a bishop who presided over several others—a primate. It was borne by the bishops of Alexandria, Antioch, Ephesus, Cæsarea, and Constantinople, till it was finally exchanged for the title of Patriarch. A superior over several monasteries was also called in ancient times an exarch. The same title is also borne, in the modern Greek Church, by the person who 'visits' officially, as a sort of legate of the patriarch, the clergy and churches in a province.

EXCA'MBION, in Scotland, is the legal name for an exchange of lands. Heirs possessing under deeds of entail are empowered by the so-called Montgomery Act (10 Geo. III. c. 51) to exchange or excamb certain portions of the entailed lands. The portions exchanged must not include the principal mansion-house or offices, or the garden, park, home-farm, or policy, or more than one-fourth in value of the estate. As to the conditions under which, and the proceedings by which, excambions of entailed lands are effected, see Bell's *Law Dictionary*.

EXCELLENCE, or **EXCELLENCY**, a title now given to ambassadors, as representing not the affairs alone, but the persons of sovereign princes, to whom it was formerly applied. The privilege of being addressed as 'Your Excellence,' and of demanding a private interview with the prince to whom he is accredited, are the chief distinctions between the privileges of an ambassador, and an envoy or minister plenipotentiary. See Ambassador, Embassy.

EXCHA'NGE, a term applied to buildings or places of resort for merchants. The name Bourse (Purse) is applied in France and Belgium to a resort of this kind; and in Hamburg, and some other German cities, there is the equivalent word Börse. Exchanges have usually comprehended an open quadrangle, surrounded by an arcade, free to all persons; but in some cases large reading-rooms now constitute resorts of this kind, and these are open only to a body of subscribers, and visitors whom they introduce. Of this description are the Exchanges of Manchester and Glasgow.

Exchanges originated in the commercial cities of Italy, Germany, and the Netherlands, from which last-named country they were copied by England. The merit of introducing them is due to Sir Thomas Gresham, who, having resided as British agent at Antwerp in 1550, chose the Bourse of that city as a model for the Royal Exchange of London. Their institution in England is therefore coincident with the rise of commercial prosperity at the middle of the 16th century. The first stone of Gresham's Burse, for so it was originally called, was laid June 6, 1566, a site being found for it by removing eighty houses in Cornhill, and it was finished in November 1567. It consisted of a quadrangle with an arcade; above was a corridor with stalls, for the sale of wares. This corridor was called the *pawn*—believed to be a corruption of *bahn*—Ger. for path or walk. Outside were shops. On January 23, 1570—1571, the Burse was ceremoniously opened by Queen Elizabeth immediately after dining at the house of Sir Thomas Gresham in Bishopsgate Street. Having viewed the whole Burse, the queen, by herald and trumpet, caused it to be proclaimed 'The Royal Exchange.' This first Exchange of London was almost entirely destroyed by the great fire of 1666. A new Exchange was forthwith erected on the spot, and opened September 28, 1669. This second Royal Exchange had the same fate; it was destroyed by fire, January 10, 1838. The foundation-stone of the third Exchange was laid by Prince Albert, January 17, 1842. Completed in three years, at a cost of £150,000, from the designs of W. Tite, it was opened January 1, 1845, by Queen Victoria, who declared it 'to be her royal will and pleasure that this building be hereafter called The Royal Exchange.'

The term Exchange seems to have been naturally adopted from the circumstance that buying and exchanging of merchandise, and also exchanging and paying away of money, formed the chief object of concourse. In the present day, early intelligence in matters affecting commerce and public finance forms a principal attraction of this kind of resort. Although open daily, there are usually certain days and hours of meeting when the throng is considerable. The meeting is familiarly called 'Change;' as, for example, 'Change commences at 1 o'clock, and it is worth while seeing the crowd that comes thronging at that hour.'—Murray's *Handbook*, article 'Hamburg.' The two great days of meeting at the Royal Exchange, London, are Tuesdays and Fridays, and the busiest time is from 3 to 4 o'clock. At this time are seen the greatest people on Change; some of whom, such as the Rothschilds, occupy a well-known spot.

In London, there are several other Exchanges, but for special purposes; among these are the Corn Exchange in Mark Lane, and the Coal Exchange in Lower Thames Street. Exeter Change, which was a sort of bazaar, with a menagerie of wild beasts, stood in the Strand, upon or near the site of the house of the Earl of Exeter; the building, as an interruption to the thoroughfare, was removed in 1829. The Bourse at Paris and at Marseille, also the Merchants' Exchange in Wall Street, New York, may be mentioned as buildings of great extent and elegance. Lately, some handsome and commodious Corn Exchanges, as resorts for grain-dealers, have been erected in various towns in Great Britain.

EXCHANGE, in Political Economy, is sometimes applied to the conversion of the money of one country into its equivalent in the money of another —as by stating the relation which French napoleons and francs bear to British pounds. The technical meaning of the word has now, however, come to be the difference between the actual value of money, taken by the standard of bullion, in any two places with relation to each other. If, in London, it costs more than £100 to pay £100 in St Petersburg, the rate of exchange is against the former town, and in favour of the latter; an inhabitant of which will be able to pay a debt of £100 in London with less than £100 worth of bullion in St Petersburg. The process will be best explained by analysing it through means of simple examples. If Thomson & Co. of London buy £100 worth of wine from De la Rue of Paris, and De la Rue, on the other hand, buy £100 worth of cotton goods from Thomson & Co. of London, the two debts, *were there no others between the merchants of the same towns*, would extinguish each other, and there would be no necessity either for transmitting money or drawing bills of exchange. Suppose, however, that it is not De la Rue, but his neighbour Bonchamp who has bought the £100 worth of cotton goods from Thomson & Co., then the debts of all will be settled by Bonchamp paying £100 to De la Rue on Thomson & Co.'s account. Suppose, next, the case of De la Rue being due nothing to Thomson & Co., and Bonchamp being due them only £50, a like sum has to be otherwise found. Van Pradt of Amsterdam is due precisely this sum to Thomson & Co., while either De la Rue or Bonchamp is due the same amount to Van Pradt for a purchase of Gouda cheeses; then it is clear that the several debts can be adjusted among them without the transmission of bullion. It will cost some trouble to adjust the payments, however, and this trouble will have to be paid for. As in paying Thomson & Co. their debt of £100, De la Rue will have to pay for this trouble, the rate of exchange will be against him. If the debt, or any part of it, cannot be met by such an adjustment out of cross debts and credits, it will be necessary for the debtor to send bullion to his creditor; and this being an expensive process, it throws the rate of exchange against the debtor who so pays. For instance, if the sum due by the Frenchmen to Van Pradt was only £25 instead of £50, then De la Rue would have had to be at the expense of sending £25 to London in bullion. No such actual transactions take place in the existing mercantile world, because the accounts in debtor and creditor connected with the three towns above referred to are to be counted in thousands, and ramify into other towns; but the above examples may be held to represent the groups of debtors and creditors, as algebraic signs represent quantities. The individual merchants in one trading town have no idea how the surplus of debit or credit may lie between them, far less can they tell how it may be adjusted by debits and credits in other towns; but through the agency of bankers, bill-discounters, and other persons who deal in money, the relations of all trading-places towards each other are in a constant state of shifting and adjustment; and any one who has to pay a debt in any trading-place can find out how much he has to give to get that debt paid, and can pay it accordingly. When, through the operation of these complicated transactions, you require to give more than £100 in London to get that amount paid in Paris, then the rate of exchange is against London, and is in favour of Paris, where less than £100 in cash will pay a debt of £100 in London. The difference will generally depend on the difficulty of adjusting questions of debt and credit throughout the field of European commerce, in such a manner as to get the debt paid. If it cannot be paid by adjustment, then bullion must be sent; and thus it is generally said, that the rate of exchange against any place is limited by the charge of transmitting bullion to it. The rate of exchange is liable to be brought to a level also by commercial exportation and importation, since, whenever it is expensive to get money sent to a country, there is a temptation to send goods to that country, to compensate the debt. In the general circle of transactions of this kind, the state or town which has the largest amount of transactions will have the largest number of debtors and of creditors, and will thus afford the chief facility for each compensating the other. It is thus that London is the centre of the money-market, where all the debts and credits in the world may be said to meet and extinguish each other. While the old notions about the Balance of Trade (q. v.) existed, it was supposed that the nation which the exchange was against was going to ruin; while that which it was in favour of was prospering through the other's loss. At present, it is inconvenient and expensive to a country to have the exchange against it. An adverse exchange generally indicates a sort of break in the circle of trade, which it would be advantageous to fill up, and *may* be caused by the commerce of a country decreasing; on the other hand, however, the imports for which a country pays in cash or in expensive bills, may be the same as a highly advantageous traffic. Gold-producing countries find bullion their most advantageous export, and the same is the case with countries into which gold has flowed in excess.

EXCHANGE, Deed of, in English law, a common law assurance, whereby persons severally seised of lands, mutually grant them in exchange, each his own land for that of the other. In order to a valid exchange, five things are necessary: 1. The two subjects must be of the same nature, as lands for lands, chattels for chattels, but not real for personal estate. 2. The parties must take an equal estate; thus, an estate in fee cannot be exchanged for an estate tail. 3. The word 'exchange' must be used. 4. There must be entry, and if either party die before entry, his heir may avoid the exchange. 5. Since the statute of Frauds (29 Car. II. c. 3), if the interest be larger than a term for three years, the exchange must be in writing. A mutual warranty and right of entry was formerly implied in an exchange. This effect of the deed has been taken away by 8 and 9 Vict. c. 106, s. 4. By the 8 and 9 Vict. c. 118,

s. 92, called the Common Enclosure Act, the commissioners are empowered to make exchanges for the better carrying out of the purposes of the act. A deed of exchange closely resembles in its particulars an Excambion (q. v.) in Scotland.

EXCHA'NGES, Military, are certain arrangements made between officers of the English army. An officer may exchange, or change places, in the Guards, or Line, with another of equal rank in any regiment of the above corps, by mutual consent, and on payment of such a sum as shall represent the difference of value between the commission vacated and that assumed. As each of the exchanging officers enters his new corps at the bottom of his rank, exchange benefits officers, especially those unable to purchase promotion, who remain in their original regiment, by advancing them towards the top of the list, and therefore nearer to promotion on a non-purchase vacancy occurring. An officer on full-pay may exchange with another on half-pay, provided a younger life be not thereby added to the half-pay list, and subject always to the consent of the Secretary for War. If the rank be one of those which are purchasable (see Commissions, Army), a payment of money from one officer to another is necessary to complete an exchange between full-pay and half-pay; the amount having relation legally to the regulated, actually to the market value of each kind of commission, as noticed in the article just cited. Exchanges are ordinarily arranged by the army agents.

EXCHE'QUER, Chancellor of the. The office of Chancellor of the Exchequer, in modern times, will be accurately described when we say that he is the first finance minister of the Crown. Strictly speaking, he is the under-treasurer, the office of Lord High Treasurer being now vested in the Lords Commissioners of the Treasury. When the Prime Minister is a member of the House of Commons, he sometimes holds the office of Chancellor of the Exchequer. The judicial functions of the Chancellor of the Exchequer may now be considered matter of history. See Exchequer, Court of. When the chief baron and the barons are equally divided in opinion, he may be required to rehear the cause with the barons, and to give his opinion. But the last instance in which this was done was in 1735; and though the decision which Sir Robert Walpole gave is said to have given great satisfaction, the custom is not likely to be reverted to.

EXCHEQUER, Court of, one of the supreme courts of common law in England. The Court of Exchequer was originally the court wherein all matters relating to the royal revenues were adjudicated upon. It is said (Madox, *Hist. of Ex.* i. 177) that as early as the reign of William the Conqueror a Court of Exchequer was in existence. This was probably nothing more than a branch of the *Aula Regia*, or great council of the nation; but on the subdivision of that court in the reign of Edward I., the Court of Exchequer acquired a separate and independent position. The special duty then assigned to the court was to order the revenues of the crown, and to recover the king's debts and duties. The court was then denominated the *Scaccarium*, a word derived, it is said, from *scaccus* or *scaccum*, a chess-board; and it was so called because a checkered cloth was anciently wont to be laid upon the table of the court (Madox, *Hist. of Ex.*), a practice which, until the late act, prevailed in the Court of Exchequer in Scotland. The court formerly consisted of two divisions, an equity, and a common law or plea side. Lord Coke (*Inst.* iv. 118) appears to doubt whether the equitable jurisdiction of the court can be traced back further than the statute 33 Henry VIII. c. 39. This equitable jurisdiction of the Exchequer was abolished by 5 Vict. c. 5, and transferred to the Court of Chancery. On the first institution of the court, the business was chiefly confined to matters connected with the royal revenue, but a privilege was conceded to all the king's debtors and farmers, and all accountants of the Exchequer, to sue and implead all manner of persons. This privilege was exercised by means of a writ of *quo minus* (now abolished by 2 Will. IV. c. 39), wherein it was set forth that the plaintiff being a debtor of the king, was, by reason of the wrong done to him by the defendant, deprived of the means of discharging his debt to the crown (*quo minus sufficiens existit*). The benefit of this writ was by degrees extended to all the lieges, on the fiction that they were crown debtors. By this means the Court of Exchequer acquired a concurrent jurisdiction with the other courts of common law. The judges of the Exchequer consisted originally of the lord treasurer, the chancellor of the Exchequer, and three puisné judges; these last were called barons of the Exchequer. The title of baron is said by Mr Selden (*Tit. of Hon.* 2, 5, 16) to have been given to the judges in the Exchequer because they were anciently made of such as were barons of the kingdom. The chancellor of the Exchequer sat only on the equity side of the court. The last occasion on which he was called upon to exercise his judicial functions was in the case of Naish *v.* the East India Company, when the judges were equally divided in opinion. This case occurred in Michaelmas term 1735, when Sir Robert Walpole was chancellor of the Exchequer, and his judgment is said to have given general satisfaction. The court now consists of five judges—viz., the chief baron, and four barons of Exchequer. From this court an appeal lies in Error (q. v.) to the Court of Exchequer Chamber.

The Court of *Exchequer Chamber* was originally a court of all the judges in England assembled for decision of matters of law (Coke, *Inst.* iv. 110, 119). Lord Campbell states, that the lord chancellor was in the habit of adjourning cases of extraordinary importance into the Exchequer, that he might have the opinion of the twelve judges (*Lives of the Chancellors*, i. 10). But the ordinary jurisdiction of the Court of Exchequer Chamber is as a court of error, in which capacity it reviews the judgments of the three courts of common law. This court was established by 31 Edw. I. c. 12, for the purpose of reviewing the decisions of the common law side of the Court of Exchequer, and was composed of the judges of the other two courts—viz., the Queen's Bench and the Common Pleas. By 27 Eliz. c. 8, it was enacted that the judges of the Common Pleas and Exchequer should form a second Court of Exchequer Chamber, for review of certain cases in the Queen's Bench. And now, by 11 Geo. IV., and 1 Will. IV. c. 70, the Court of Exchequer Chamber is constituted the court of review for all proceedings in Error (q. v.) from the courts of common law, the judges of two of the courts always forming the court of appeal for the proceedings of the third. The Court of Exchequer Chamber is also, by 1 Will. IV. c. 70, constituted the court of review for criminal cases on writ of error from the Queen's Bench.

In Scotland, before the Union, the Exchequer was the king's revenue court. It consisted of the treasurer, the treasurer-depute, and as many of the lords of Exchequer as the king was pleased to appoint (Ersk. i. 3, 30). The Scottish Court of Exchequer was continued by the 19th article of the treaty of Union, until a new court should be established, which was effected by 6 Anne, c. 26. A privative jurisdiction was conferred on the court as to questions *relating to* revenues and customs of excise, and as to all honours and estates real and personal, and forfeitures and penalties arising to the crown within Scotland. But questions of *title* to lands, honours, &c., were reserved to the Court of Session. The judges of the court were, the high treasurer of Great Britain, the chief baron, and four other barons, and English barristers as well as Scotch advocates were allowed to practise in the court. In cases of difficulty, and where there was a collision of jurisdictions, it was formerly not unusual to hold conferences with the barons; and the form of desiring the conference was to send the lord advocate, and, in his absence, the solicitor-general, to request a meeting, though it has been doubted whether they were bound to carry the message (Shand's *Practice*, 27). By 2 Will. IV. c. 54, it was provided that successors should not be appointed to such of the barons as should retire or die, and that the duties of the court should be discharged by a judge of the Court of Session. And now, by 19 and 20 Vict. c. 56, the Court of Exchequer is abolished, and the jurisdiction transferred entirely to the Court of Session.

The Court of *Exchequer Chamber* in Ireland was established by 40 Geo. III. c. 39. It consists of the chief justices, chief baron, and the rest of the justices and barons, or any nine of them.

EXCHEQUER BILLS, bills issued at the Exchequer under the authority of acts of parliament, as security for money advanced to the government. They contain an engagement on the part of the government for the payment of the principal sums advanced with interest. These bills form the chief part of the unfunded debt of the country. They were first issued in the reign of William III., in the year 1696, and were drawn for various amounts from £100 to £5. At that time they bore interest at the rate of threepence per day on a hundred pounds (Macaulay, *History of England*, iv. 700). The interest was reduced to 2*d.* during the reign of Anne. During the war 1793—1814, the rate of interest was usually 3½*d.* At present, it is generally from 1½*d.* to 2½*d.* per £100 per diem. Holders of these bills are exempt from all risk, except that arising from the amount of premium or discount they may have given for them. The bills pass from hand to hand as money, and are payable at the Treasury at par. They may also be paid to government in discharge for taxes. When it is intended to pay off outstanding Exchequer bills, public notice is given by advertisement. The advances of money to the government by the Bank of England are made on Exchequer bills. These bills are a convenient means whereby the government can meet a sudden demand for unusual expenditure. Thus (as will be seen below) during the pressure of the Indian mutiny (1856—1858), the amount due on Exchequer bills greatly exceeded that of the years which immediately preceded and followed. Amount of Exchequer bills unprovided for 1855 to 1860: 1855, £17,151,400; 1856, £21,182,700; 1857, £20,989,000; 1858, £20,911,500; 1859, £13,277,400; 1860, £13,228,300.

EXCI'PIENT (Lat. *excipio*, I receive), an inert or slightly active substance, introduced into a medical prescription as a *vehicle*, or medium of administration for the strictly medicinal ingredients. Thus, conserve of red roses, or bread-crumb, is used to make up pills; sulphate of potass, or white sugar, in medicinal powders; water, mucilage, white of egg, and many other substances in fluid mixtures.

EXCI'SE, the name of a tax on commodities, from the Latin *excisus*, cut off, as being a portion of the value of the commodity cut off and set apart for the revenue before the commodity is sold. This is not its actual nature, however, for the manufacturer who looks to a profit on his outlay does not give part of the value to the revenue; he merely counts the tax as part of his expenditure, which he intends to get back with a profit, so that it constitutes an addition to the ultimate price which the purchaser or consumer has to pay. A tax on commodities sold and bought is a very obvious one, adopted in almost every country where taxes have been raised otherwise than on the land or by the head; but it has generally appeared in the simple shape of a toll on goods brought to market, and the complicated arrangements for officially watching the process of a manufacture through all its stages, for the purpose of seeing that none of the dues of the revenue are evaded, is of comparatively modern origin. It had been for some time successfully practised in Holland, when the Long Parliament, who were looking about for a fruitful source of revenue, observing how productive it had been there, established an excise on liquors in England in 1643. It was continued at the Restoration by the same statute which abolished aids, escuages, and the other feudal exactions, along with the Court of Wards established for enforcing them, and the royal prerogatives of purveyance and preemption. The excise may thus be considered the price paid for the abolition of the burdens of the feudal system. Though always unpopular, the excise in some form or other has ever since continued to be a material element in the taxation and revenue of Britain. In the earlier part of last century, Sir Robert Walpole entertained the notion of enlarging its productiveness while mitigating its proportional pressure, by the bonding system, which suspends the exaction of the duty until the goods are sold, and thus leaves the manufacturer all his capital to be devoted to production. See WAREHOUSING SYSTEM. But the rumour of an enlargement of the unpopular excise duty created a general excitement, and the memorable cry of 'Liberty, Property, and no Excise' compelled Walpole to abandon his project.

An excise, when compared with other taxes, has its good and its bad features: it is a method of extracting money for national purposes from personal expenditure on luxuries, and is especially serviceable when fed from those luxuries the use of which in excess becomes a vice. On the other hand, it renders necessary a system of inquisitorial inspection not only very offensive to all free people, but very open to abuse and fraud; while at the same time excessively high duties, and duties on commodities strictly of domestic manufacture, lead to smuggling and all its demoralising consequences. The evils of an excise were formerly aggravated by the practice of farming the duties—that is, by letting them to the highest bidder, whose interest it became, like any other contractor, to make the greatest possible profit by his speculation, and consequently to exact the duties in the most rigorous manner. In every well-regulated revenue system, it is of course only fair to all parties that the duty as the law lays it on should be fully exacted; but in the age of farming, the arrangements were all slovenly, and there was much latitude of power in the hands of the farmers. The farming system became very oppressive in France, especially in the *gabelle* or excise on that necessary of life, salt. It is a curious fact, however, that when the farming of the excise was abolished in Scotland by the Union, the people grumbled, saying they were easier under the farmers, their own neighbours, who acted on the principle of 'live and let live,' than under the officers sent down from England, who rigidly collected the impost.

An excise works most easily when it is laid on some commodity banished from domestic production and created by manufacturers on a large scale. In a great distillery, the excise officer is almost a portion of the establishment, who has an eye on every step of the process, with the view of seeing that the commodity does not get into the market without government obtaining its proper share—sometimes far the greater part—of the market price. The social influence of such an arrangement is very different from that of the old candle and salt duties, which made it the function of the exciseman to pounce on a farmer's family melting the surplus tallow of the last killed sheep, or of a fisherman boiling sea-water to procure salt for his potatoes. The manufacturer, however, though he has the benefit of the bonding system, feels the excise regulations to be a perpetual drag and hinderance in his operations, since there are multitudes of minute operations which he cannot perform without sending special notice to the excise department, or having an officer actually present. This renders it necessary, too, that all the steps of the process should not merely be defined as between the manufacturer and the officer, but should be set forth in an act of parliament; and hence deviations for the purpose of economy, or by way of experiment, become difficult, and sometimes impracticable. As difficulties with which the producer has to contend, these things require him to lay on the selling price of the commodity a larger addition, by reason of the excise, than the actual amount of the duty.

No method of taxation requires a nicer adjustment to the social condition of a country than an excise. Thus, in England, in the year 1746, a duty of 20*s.* a gallon was laid on spirits, with the view of suppressing the vice of drunkenness, which, on the other hand, it greatly increased, for the law became a dead letter, and the smuggler fully supplied the market, although within the two years in which the law was in force, no fewer than 12,000 persons were, according to Tindal's History, convicted of offences against the act. In Scotland, the duty, which was 5*s.* 6*d.* a gallon, had to be reduced in 1823 to 2*s.*, on account of the prevalence of smuggling—half the consumption of the country, in fact, paying no duty. The duty has since then been gradually raised, until it now amounts to 10*s.* a gallon, forming a vast source of revenue. The whole excise revenue of the United Kingdom for 1860 amounted to £20,361,000, of which nearly four-fifths were supplied from the consumption of liquor—viz., £10,000,191 from spirits, and £6,852,458 from malt; and there were besides the hop-duty, producing £46,281, and the licence-duties for selling liquors. The productiveness of this great source of revenue, and the expense and annoyance connected with the levying of a duty on other miscellaneous commodities, has led to the gradual removal of many excise duties, as, for instance, on salt, candles, leather, glass, soap, and lastly, on paper, which was relieved on the 1st of October 1861.

There was formerly a separate department with a very complex machinery for the administration of the excise. It is now superintended by the commissioners of inland revenue; and for the purposes of local collection and inspection, the country is divided into districts, in each of which there is generally a collector and a certain number of supervisors.

Certain taxes which are not properly of the nature of excise, but rather of licence duties for following particular pursuits, are collected in the excise department, as, for instance, the duties payable by auctioneers, by letters of horses and carriages, tobacco-dealers, and soap-makers. The only article properly excisable besides liquors is chicory, which was excised for the purpose of obviating the adulteration of coffee.

E'XCITANTS, or STI'MULANTS, are those pharmaceutical preparations which, acting through the nervous system, tend to increase the action of the heart and other organs. They all possess more or less of a pungent and acrid taste, and give rise to a sensation of warmth when placed on a tender part of the skin. The class is a very numerous one, and the application of excitants or stimulants to the human subject should always be under the supervision of a qualified medical practitioner.

EXCLU'SION BILL, a proposed measure for excluding the Duke of York, afterwards James II., from the succession to the throne, on account of his avowed Catholicism. A bill to this effect passed the Commons in 1679, but was thrown out by the Upper House. As the new parliament summoned in 1681 seemed determined to revert to this measure, it was dissolved, and Charles ruled henceforth without control. See Charles II., James II.

EXCOMMUNICA'TION is exclusion from the fellowship of the Christian Church. The ancient Romans had something analogous in the exclusion of persons from the temples and from participation of the sacrifices, which persons were also given over with awful ceremonies to the Furies. The Mosaic Law decreed excommunication in case of certain offences; and the intimate connection of things civil and ecclesiastical under the Jewish polity, rendered it terrible even as a temporal punishment. The Jews, in practice, had three degrees of excommunication. The first, *Niddui*, was an exclusion from the synagogue for thirty days, that the offender might be ashamed. The second, *Cherem*, was also for thirty days, but beside exclusion from the synagogue, carried with it a prohibition to all other Jews of any intercourse with the individual, and was often proclaimed with sound of trumpet. The third, *Shammatha* or *Anathema Maranatha* (see 1 Cor. xvi. 22), was exclusion from the synagogue and privileges of the Jewish Church for life, with loss of civil rights, and was accompanied with terrible curses, in which the offender was given over to the judgment of God. In the Christian Church, excommunication has in all ages been practised, as indeed every society must necessarily have the power of excluding unworthy members and those who refuse to comply with its rules, and the New Testament plainly recognises and establishes this right in the church. But two different degrees of excommunication were soon distinguished—the first or lesser, a mere exclusion from the Lord's Table and from other privileges of members of the church; the second or greater, pronounced upon obstinate offenders and persons who departed from orthodox doctrine, more solemn and awful, and not so easily capable of being revoked. Penances and public professions of repentance were required; and in Africa and Spain, the absolution of *lapsed* persons (i. e., those who in time of persecution had yielded to the force of temptation, and fallen away from their Christian profession by the crime of actual sacrifice to idols) was forbidden, except at the hour of death, or in cases where martyrs interceded for them. But for a long time, no civil consequences were connected with excommunication. Afterwards, the greater excommunication was accompanied with loss of political rights, and exclusion from public offices. The power of excommunication also, which had been at first in the church as a body, gradually passed into the hands of the bishops, and more especially of the popes, who did not scruple to exercise it against entire communities at once. The *capitularies* of Pepin the Less, in the 8th c., ordained that the greater excommunication should be followed by banishment from the country. The Roman Catholic Church pronounces the sentence of excommunication with many circumstances of terrible solemnity, and it contains a prohibition to all Christian persons of all intercourse with the person excommunicated, and of extending to him even the most ordinary social offices. The latest 'examples' made by the pope were Napoleon I. in 1809, and Victor Emmanuel, king of Italy, in 1860; neither of whom, however, was excommunicated by name, the pope having confined himself to a solemn and reiterated publication of the penalties decreed by his predecessors against those who unjustly invaded the territories of the Holy See, usurped or violated its rights, or violently impeded their free exercise. Pope Innocent III., in the Lateran Council (1215), declared that excommunication put an end to all civil rights and dignities, and to the possession of any property. The excommunication of a sovereign was regarded as freeing subjects from their allegiance, and in the year 1102, this sentence was pronounced against the Emperor Henry IV., an example which subsequent popes likewise ventured to follow. But the fearful weapons with which the popes armed themselves in this power of excommunication, were rendered much less effective through their incautious employment, the evident worldly motives by which it was sometimes governed, and the excommunications which rival popes hurled against each other during the time of the great papal schism. The Greek Church also makes use of excommunication, and every year at Constantinople, on a certain Sunday, the greater ban is pronounced against the Roman Catholic Church.—The Reformers retained only that power of excommunication which appeared to them to be inherent in the constitution of the Christian society, and to be sanctioned by the Word of God; nor have any civil consequences been generally connected with it in Protestant countries. To connect such consequences with excommunication in any measure whatever, is certainly inconsistent with the principles of the Reformation. Nevertheless, in England, until the 53d of Geo. III. c. 127, and in Ireland, until the 54th, c. 68, persons excommunicated were debarred from bringing or maintaining actions, from serving as jurymen, from appearing as witnesses in any cause, and from practising as attorneys in any of the courts of the realm. All these disabilities were removed by the statutes above named; and the excommunicated were declared no longer liable to any penalty, except 'such imprisonment, not exceeding six months, as the court pronouncing or declaring such person excommunicate shall direct.'

In the Roman Catholic Church, the power of excommunicating is held to reside, not in the congregation, but in the bishop; and this is believed to be in exact accordance with the remarkable proceeding commemorated in the First Epistle of St Paul to the Corinthians (1 Cor. v. 3–5), and with all the earliest recorded examples of its exercise. Like all the other powers of the episcopate, it is held to belong, in an especial and eminent degree, to the Roman bishop, as primate of the church; but it is by no means believed to belong to him exclusively, nor has such exclusive right ever been claimed by the bishops of Rome. On the contrary, bishops within their sees, archbishops while exercising visitatorial jurisdiction, heads of religious orders within their own communities, all possess the power to issue excommunication, not only by the ancient law of the church, but also by the most modern discipline. As to the prohibition of intercourse with the excommunicated, a wide distinction is made between those who are called 'tolerated' and those who are 'not tolerated.' Only in the case of the latter (a case extremely rare, and confined to heresiarchs, and other signal offenders against the faith or public order of the church) is the ancient and scriptural prohibition of intercourse enforced. With the 'tolerated,' since the celebrated decree of Pope Martin V. in the Council of Constance, the faithful are permitted to maintain the ordinary intercourse. It is a mistake, likewise, to ascribe to Catholics the doctrine, 'that excommunication may be pronounced against the dead.' The contrary is expressly laid down by all canonists (Liguori, *Theologia Moralis*, lib. vii. n. 13, 1). In the cases in which this is said to have been done, the supposed 'excommunication of the dead' was merely a declaration that the deceased individual had, *while living*, been guilty of some crime to which *excommunication is attached by the church laws.* Catholic writers, moreover, explain that the civil effects of excommunication in the medieval period—such as incapacity to exercise political rights, and even forfeiture of the allegiance of subjects—were annexed thereunto by the civil law itself, or at least by a common international understanding in that age. Examples are alleged in the law of Spain, as laid down in the Sixth Council of Toledo—a mixed civil and ecclesiastical congress—(638); in the law of France, as admitted by Charles le Chauve (859); in the Saxon and in the Swabian codes; and even in the English laws of Edward the Confessor; all which, and many similar laws, proceed on the great general principle of these medieval monarchies, viz., that orthodoxy and communion with the Holy See were a necessary condition of the tenure of supreme civil power; just as by the 1 Will. and Mary, s. 2, c. 2, profession of Protestantism is made the condition of succession to the throne of England. Hence, it is argued, the medieval popes, in excommunicating sovereigns, and declaring their subjects released from allegiance, did but declare what was, by the public law of the period, the *civil* effect of the exercise of what in them was a *spiritual* authority.

By the discipline of the Roman Catholic Church, kings or queens, and their children, are not included in any general sentence of excommunication, unless they be specially named.

EXCRETION. See Secretion.

EXCULPA'TION, Letters of, in the law of Scotland, are the warrants granted to the accused party, or panel as he is called, in a criminal prosecution, to enable him to cite and compel the attendance of such witnesses as he may judge necessary for his defence. These letters are issued as a matter of course, on application at the Justiciary Office, if the prosecution be in the High Court, or to the sheriff clerk in cases of Sheriff Court libels. If there be any special defence, such as *alibi*, a written statement of its nature along with the articles to be founded on, and a list of the witnesses to be called, must be lodged with the clerk of court the day before the trial.

EXE, a river of the south-west of England, rises in Exmoor, in the west of Somersetshire, and flows 19 miles south-east to the borders of Devonshire, and then 35 miles south through the east part of that county into the English Channel at Exmouth. The lower five miles form a tideway a mile broad at high water, with wooded and picturesque shores, and navigable for large vessels. The chief tributaries are the Barle, 24 miles long, Batham, Loman, Culm, Dart, Creedy, and Clist. The E. passes Dulverton, Brompton, Exeter, and Topsham. It has a clear and merry current through wooded and romantic vales.

EXECUTION, in the law of Scotland, signifies the attestation by a Messenger-at-arms (q. v.), or other officer of the law, that he has given a citation, or carried through a Diligence (q. v.), in terms of the warrant of the judge. It corresponds to an affidavit of service of writ or summons in the common law courts, and of a bill or claim in Chancery. Executions must be subscribed by the messenger or other executor, and by one or two witnesses; and where the execution consists of more pages than one, each page, or at least each leaf, must be so attested. The witnesses are witnesses to the fact of service, not merely to the subscription of the messenger; and the execution ought strictly to bear that they are witnesses to the premises. Till the passing of recent acts (1 and 2 Vict. c. 114, &c.; see Evidence), two witnesses were necessary to all executions, but one is now sufficient, except in cases of poinding, where two are still required. (Bell's *Law Dictionary*, and authorities cited.)

EXECUTION, Criminal. See Capital Punishment.

EXECUTION, Military and Naval, usually takes place by hanging or shooting, according to the rank of the offender and the nature of the offence. In some rare instances, blowing from the mouth of a gun has been resorted to. For particulars of the acts for which death is awarded, see Punishments, Military and Naval, and Mutiny Act.

EXECUTION OF CRIMINALS. See Capital Punishment. Executions take place publicly in the United Kingdom, and, as far as known, all other countries, with the exception of the United States, Bavaria, and the colony of Victoria, where they take place within the precincts of the prison, in the sight of certain officials and others who are invited to be present. As one of the main objects of capital punishments is to strike terror by example, this method of private executions, as it may be called, necessarily fails in an essential feature; but this defect is held to be more than compensated by the prevention of what is in reality a brutalising public spectacle. In London, executions took place for the most part at Tyburn until 1783, when a scaffold erected in front of Newgate prison became the common place of execution. 'The gallows was built with three cross-beams for as many rows of sufferers; and between February and December 1785, ninety-six persons suffered by the "new drop," substituted for the cart. About 1786, here was the last execution followed by burning the body; when a woman was hung on a low gibbet, and life being extinct, fagots were piled around her and over her head, fire was set to the pile, and the corpse burned to ashes. On one occasion the old mode of execution was renewed: a triangular gallows was set up in the road opposite Green-Arbour Court, and the cart was drawn from under the criminal's feet.'—Timbs's *Curiosities of London.* To render executions more impressive, they were in some cases ordered to take place near the scene of guilt; but this is now seldom practised. As in London, the ordinary place of execution in most towns in Great Britain and Ireland is outside the prison. At Edinburgh, executions took place chiefly in the Grassmarket, until 1784, when they were transferred to a platform at the west end of the Tolbooth or ancient prison, a building removed in 1817. Executions now take place on a scaffold erected in the open street, near the site of the old prison. The interval between sentence and execution is now in most places about three weeks, the nature of the crime not making any difference in this respect. In all parts of the British Empire, the convict under sentence of death is allowed to make choice of the spiritual adviser who shall attend on him; and generally, everything that humanity can suggest is done to assuage the bitterness of his fate. At one time, the bodies of murderers after execution were, in terms of their sentence, delivered to professors of anatomy for dissection; and it would appear that in some instances the mangled corpse was made a kind of public show. Such took place on the execution of Earl Ferrers, 1760. The body having been conveyed from Tyburn in his lordship's landau-and-six to Surgeon's Hall, was, after being disembowelled and laid open in the neck and breast, exposed to public view in a first-floor room. A print of the time depicts this odious exhibition. The ordering of the bodies to be dissected, having led to great abuse, was abolished in 1832; since this period, the bodies of executed murderers are buried within the precincts of the prison, and the bodies of other malefactors are given to their friends. See Anatomy (in Law). It was also at one time customary to hang the bodies of certain malefactors in chains after execution—as, for example, the bodies of pirates were so hung on the banks of the Thames—but this usage, revolting to public feeling, is likewise abandoned. From the improved state of the criminal law, death-sentences are now of comparatively rare occurrence, and still more rarely are such sentences executed, for, except in cases of deliberate and aggravated murder, the extreme sentence of the law is now usually commuted by the crown into penal servitude for life. The secretary of state, however, to whom practically belongs the attribute of mercy, exercises his power in this respect with obviously much care and discretion. The pardoning power of governors in the United States is said to be greatly abused.

In the progress of manners, a great change has taken place in the public attendance at executions. Formerly, persons belonging to the higher and middle ranks were habitually present at these dismal exhibitions; many hiring windows at a considerable sum for the occasion. Literature furnishes us with various instances of persons of cultivated mind attending regularly from a morbid love of the spectacle. George Selwyn was fond of seeing executions. His friend Gilly Williams, writing to him of the condemnation of John Wesket (January 9, 1765) for robbing the house of his master, the Earl of Harrington, says: 'Harrington's porter was condemned yesterday. Cadogan and I have already bespoke places at the Brazier's. I presume we shall have your honour's company, if your stomach is not too squeamish for a single swim.'—Selwyn's *Correspondence*, vol. i. p. 323. The Earl of Carlisle, writing to Selwyn, speaks of having attended the execution of Hackman, a murderer, April 19, 1779.—*Ibid.* vol. iv. p. 35. James Boswell, the biographer of Johnson, had a passion for seeing executions, and even for accompanying criminals to the gallows. He was indulged with a seat in the mourning coach to Tyburn, along with the above-named Hackman, the ordinary of Newgate, and sheriff's officer. Visiting Johnson on the 23d of June 1784, he mentions that he has just come from the shocking sight of fifteen men hanged at Newgate. Boswell's *Johnson*, vol. viii. p. 331, Croker's edition. At executions, there are still considerable crowds, but they consist chiefly of the lowest and most depraved of the population. During the excesses of the French Revolution, the executions in Paris were enjoyed as a spectacle by crowds of female Jacobins. From the circumstance of these furies employing themselves with knitting needles while attending daily at the scaffold, they became familiarly known as the *Tricoteuses* (Knitters). Some further information concerning executions will be found in the articles DROWNING, GALLOWS, GUILLOTINE, HANGING IN CHAINS, MAIDEN, NEWGATE, PARRICIDE, PIRATE, PRESSING TO DEATH, and TYBURN.

EXECUTION OF DEED, the performance of the ceremonies required by law in order to make a deed binding and effectual. These ceremonies in England consist in signing, sealing, and delivering. According to the ancient common law of England, signature was not necessary to a deed. By 29 Car. II. c. 3 (statute of Frauds), signing was required for almost all deeds. But it is still a question which has not been positively decided whether, when a seal is used, it is necessary that the parties should sign. When a party, from any cause, is unable to write, it is usual for him to place his mark in the place of signature. But a mark is unnecessary, and signature by another, at request of the party, is enough. Sealing is the most ancient form of authentication of deeds. In England, deeds are technically known as deeds under seal. A seal is absolutely essential to the validity of an English deed, but any species of seal is sufficient, and in practice a common wafer is usually appended. Delivery is the third requisite to authenticate a deed. Delivery may be made either to the grantee or to another person for him. In the former case, the deed becomes absolute; in the latter, it is called an *Escrow*, and does not acquire its full effect till the conditions are fulfilled. Witnesses are not absolutely required to a deed in England, but in practice it is usual that one or more witnesses should sign. As a rule, a deed must be read, if required, by a party to it; and if not read, it is void as to the party requesting. Where a person is ordered in Chancery to execute a deed or other instrument, and is in prison for failure to comply with the order, the court may make an order that the instrument be executed by the officer of the court; and the execution having been so made, the instrument is equally valid as if signed by the party. The execution of wills in England is regulated by 7 Will. IV. and 1 Vict. c. 26. By this statute it is required that every will shall be signed at the foot or end by the testator in presence of two witnesses. See WILL.

In Scotland, sealing was formerly an essential requisite for execution; but that practice was by 1584 c. 4 dispensed with in regard to registered deeds, and has long fallen into disuse. The solemnities of execution are now regulated by the old acts 1540 c. 117, and 1681 c. 5. By the former of these acts, the signature of the maker of the deed is required, and by the latter, the presence of two witnesses is made essential. In order to a valid execution of a deed or will in Scotland, it is necessary that the maker should sign in the presence of two witnesses, or should in their presence acknowledge his signature, and that the witnesses should then sign their own names, writing after them the word 'witness.' In case the maker of the deed cannot write, the deed is signed in his presence by two notaries, in presence of four witnesses. But in case of a will, one notary and two witnesses are sufficient. A deed thus witnessed is received as conclusive proof of the facts which it sets forth. Subscription by initials has been permitted in Scotland. But this mode of execution is irregular, and where it has been adopted, proof has been required that *de facto* the signature was so made. There is one exception to the rule that witnesses must attest the signature—viz., that of a deed or other instrument the whole or the essential parts of which are holograph of the testator. This instrument is valid without witnesses. Bills and promissory-notes, receipts and mercantile accounts, do not require to be holograph or attested.

EXECUTION ON CIVIL PROCESS is the method whereby a court of justice enforces its judgment on the person or estate of those against whom judgment has been given. The common law of England allows four different writs to issue against refractory debtors—viz., a *fieri facias* (called commonly a *fi. fa.*), a *capias ad satisfaciendum* (*ca. sa.*), *levari facias*, and *elegit*. These writs issue from the court where the record is on which the proceedings are grounded, and are addressed to the sheriff of the county. By a *fi. fa.* the goods and chattels of a debtor may be attached. This writ lies against privileged persons, peers, &c. A writ of *ca. sa.* is directed against the person of a debtor. It does not lie against privileged persons. Under this writ, the sheriff may imprison a debtor, and detain him until the debt has been satisfied. A writ so stringent in its effect is regarded by the law as the last remedy; hence, when a *ca. sa.* has been issued, no other writ can proceed against the debtor. But if a *fi. fa.* has been first issued for a part of the debt, a *ca. sa.* will still lie for the remainder. By 7 and 8 Vict. c. 96, s. 58, a *ca. sa.* cannot be issued for a debt under £20, unless it appear that the debt has been fraudulently incurred. A *levari facias* is now seldom used. It is directed against a man's goods and the profits of his lands. The writ of *elegit* is of very ancient date. It is directed against the lands themselves. See ELEGIT.

In Chancery, execution against the estate is effected by writ of *fieri facias*, or writ of *elegit*. Execution against the person is by writ of attachment. Should this latter writ be returned *non est inventus*, the party prosecuting has it in his option to take out a writ of sequestration, which issues of course, or to obtain an order for the serjeant-at-arms. An attachment does not lie against a peer or other privileged person, but an order called a sequestration *nisi* is issued. In cases of contempt, the Court of Chancery has also power to order personal commitment. Previous to 1 and 2 Vict. c. 110, and the orders of court consequent thereon, the performance of a decree in Chancery could only be enforced by process against the person.

Execution for debt in Scotland, or, as it is technically expressed, diligence in execution, is either real or personal: by the former, the debtor's lands may be attached; by the latter, his person and his movables. In order to entitle a creditor to use diligence against the person or estate of his debtor, the debt on which the diligence proceeds must be duly constituted by a liquid document, or by a decree, or by an action in which decree is sought. In this latter case, the law in peculiar circumstances allows diligence on the dependance, in order that a party may not be deprived of his remedy during the currency of the action, but such diligence depends for its effect upon the judgment in the cause. In the case of bonds and other instruments registered for execution (see REGISTRATION), the law allows summary diligence to proceed; that is to say, execution may proceed without the need of further application to the court. Diligence against heritage includes INHIBITION, ADJUDICATION, RANKING AND SALE, MAILS AND DUTIES, POINDING OF THE GROUND. Personal diligence is by HORNING AND CAPTION, ARRESTMENT, FORTHCOMING, and PERSONAL POINDING. See these several heads.

EXECU'TIONER, the official who inflicts capital punishment. In England, it is the province of the sheriff to perform this as well as every other ministerial duty enjoined by the criminal courts, but practically he acts by his servants or officers, and he only attends to see the law properly carried out. In royal burghs in Scotland, this duty is imposed on the civic magistracy, one of whom attends for the purpose. In times happily bygone, so numerous were the public executions, that almost every county and town had its executioner, as an acknowledged officer of justice, with a salary for his subsistence. Yet, we learn that on certain occasions, so odious and so onerous was the duty to be performed, that a special executioner was employed. Such was the case at the execution of Charles I. The task of putting this unfortunate monarch to death is well known to have been performed by two men, who, from a dread probably of the vengeance of the Royalists, had concealed their faces under visors. In consequence of the mystery thus assumed, public curiosity was much excited, and several persons fell under the suspicion of having been concerned in the bloody deed; rumour even went so far as to decide who was the wielder of the axe, and who held up the head. It cannot be said, however, that any certainty was ever arrived at on the subject. See *Chambers's Edinburgh Journal*, first series, vol. iv. p. 317.

Like many other offices, that of executioner seems to have been at one time hereditary in England. Shakspeare, in *Coriolanus* (act ii. scene 1), makes Menenius, one of the characters in the play, speak of 'hereditary hangmen.' In several German states, the office of Headsman (q. v.) is said to have been also hereditary; certain families being thus, as it were, condemned to perpetual infamy. The last headsman of the Tower of London died in 1861. The office was latterly a mere sinecure, and has not been filled up. In some parts of England, the office was annexed to other posts; for instance, the porter of the city of Canterbury was executioner for the county of Kent, in the time of Henry II. and Henry III., for which he had an allowance of 20*s.* per annum from the sheriff, who was reimbursed by the Exchequer. The sum of thirteenpence-halfpenny was long popularly spoken of as 'hangman's wages;' such sum, equal to a merk Scots, being the fee at one time paid to the executioner when he officiated. In the 17th c., this sum, small as it now appears, was considerably above the wages of a skilled mechanic.

From Gregory Brandon, the London executioner in the reign of James I., the name Gregory was employed as a familiar designation for executioners for a considerable period. Brandon had the address to procure a coat-armorial from the College of Heralds, and became an esquire by virtue of his office. One of his successors was named Dun, or 'Squire Dun,' as he was called. Dun is referred to in Butler's *Ghost*, published in 1682:

> For you yourself to act 'Squire Dun,'
> Such ignominy ne'er saw the sun.

He was succeeded about the above year by John or Jack Ketch, commemorated by Dryden (*Epilogue to the Duke of Guise*), and his name has since been synonymous with hangman.—Cunningham's *Handbook of London*, article Tyburn.

Executioners have, in some instances, come to trouble. John Price, the London executioner, was executed 31st May 1718 for murder. In the account of him, it is stated that one day, on returning from Tyburn, he was arrested for a debt, which he discharged by a small sum in his pocket, along with the proceeds of the clothes of three felons he had just executed.—*Old Bailey Chronicle*, i. p. 147. If this work can be credited, the executioner was about the same time arrested while accompanying John Meff, a criminal, to Tyburn. This arrest, which is amusingly depicted in an engraving, stayed the execution of Meff; being conducted back to Newgate, his sentence was commuted to transportation for seven years, but having returned to England before the period expired, he was taken and executed. On the 24th May 1736, the executioner, on returning from Tyburn, after executing five felons, picked the pocket of a woman of 3*s.* 6*d.* (Hone's *Every-Day Book*, ii. p. 695), but what was his punishment is not related. In 1682, Alexander Cockburn, hangman of Edinburgh, was executed for the murder of a Bedesman, or privileged mendicant. Early in the 18th c., the executioner of Edinburgh was John Dalgliesh, who acted at the execution of Wilson the smuggler in 1736, and is alluded to in the *Heart of Mid-Lothian*. It was he who also officiated at the execution of the celebrated Maggie Dickson, a woman condemned in 1738 for infanticide, but who came to life again after enduring the sentence of the law, and lived unmolested for years afterwards, as a hawker of salt in the streets of Edinburgh. It is said of Dalgliesh, that, in whipping a criminal, he made a point of laying on the lash 'according to his conscience,' which shewed him to have been a most considerate executioner. John High, or Heich, accepted the office of Edinburgh executioner in 1784, in order to escape punishment for stealing poultry; he died in 1817. See *Traditions of Edinburgh*, by R. Chambers. The emoluments of the Edinburgh executioner at one time comprehended a recompense in kind in the markets of the city—viz., a *lock* or handful, and a *gowpen* or double handful, of meal from each sack; hence he received the designation of *Lockman.* These emoluments were latterly commuted into a regular salary of 12*s.* per week, besides a free house, and a special fee of £1, 11*s.* 6*d.* at each execution; from the Exchequer the executioner also received a small annual allowance as Deemster (q. v.). The last of the Edinburgh executioners was John Scott, whom it was customary to confine in jail for eight days previous to an execution, in order to insure his attendance; the expenses incurred by him during one of these periods of seclusion being, as we find, £1, 2*s.* 6*d.*, which sum was discharged by the city. Scott was killed by a malicious assault in 1847. Since this period, Edinburgh has had no regular hangman, but, like all other places in Great Britain, depends on the services of the London executioner, who is hired for the occasion. This personage is the well-known William Calcraft. For an execution at Edinburgh in 1854, Calcraft's fee and expenses amounted to £33, 14*s.*; his assistant received £5, 5*s.*; and for taking charge of both, the city criminal officers were paid £1, 1*s.*: total expenses for the execution, £40, independently of the cost of erecting the scaffold. In 1815, the magistrates of Glasgow entered into an arrangement by stamped indenture with Thomas Young, who engaged to act as executioner at a recompense of £1 per week, a free house, with coal and candles, a pair of shoes and stockings once a year, and a fee of a guinea at each execution. At Young's death in 1837, his successor, John Murdoch, was recompensed differently. He was paid £1 per month, by way of retainer, and the sum of £10 for an execution. Since his death, Calcraft has officiated. Besides the usual emoluments or fees derived by executioners, they have from early times claimed the clothes of those who suffer at their hands as a perquisite of office. See Perquisite.

The most noted executioner of Paris was the late M. Sanson, who officiated at the mournful death-scene of Louis XVI., and is said to have possessed acquirements and feelings not to be expected from one of his degrading profession. He was latterly assisted by his son, M. Henri Sanson. The Parisian executioner is familiarly styled 'Monsieur de Paris.'

No professional executioner is employed at capital punishments in the United States. There the sentence is executed by the sheriff, with the assistance of an under-jailer; this last official performing the fatal toilet of the criminal, while the sheriff, by a movement affecting the drop, puts him to death in virtue of the sentence and the law of the state. This seems an advance on the practice in England, where, however, it could not be introduced, for the simple reason, that no one fit for the rank of sheriff or magistrate would accept of office with an obligation to perform the duty of executioner in person. The military executioner attached to an army is styled Provost-marshal (q. v.).

EXECUTIVE. See Government.

EXE'CUTOR, in England, the person to whom the execution of a last will and testament of personal estate is by testamentary appointment confided (Williams on *Executors*, 197). The mere nomination of an executor, without giving any legacy or appointing anything to be done by him, is sufficient to make a will. The appointment of an executor can only be by a will, the person who takes charge of the estate of an intestate being called an Administrator (q. v.). The appointment may be either express or constructive, i. e., gathered from the general terms of the will. The first duty of an executor is to take Probate (q. v.) of the will. He derives his title solely from the will; the estate vests in him from the death of the testator, at which time his responsibility begins, and from which time he may enter upon all the duties of managing the estate. But his position will not be recognised as suitor in any court until he has taken probate. The whole personal estate vests in the executor; and if the testator has made no disposition of the residue, it devolves, by common law and equity, upon the executor. But equity will endeavour so far to carry out the intentions of the testator as not to give the beneficial interest to the executor, where there appears from the will a necessary implication that he should not receive it. By 21 Henry VIII. c. 5, an executor is bound to prepare an inventory of the personal estate. In practice, this is not usually done unless required; but if required, it must be produced. An executor may raise actions in respect to the estate in his charge; and generally it may be said that his powers, duties, and liabilities are commensurate with those of the deceased. He may enter the house of the heir in order to remove the personal property. The first claims to be discharged are those of the funeral and the expenses of probate. He must then pay the debts; and he is responsible for paying them in due order, so that those having a legal preference shall first be discharged. An executor is not bound to accept the office; but if he administer, he cannot then renounce the executorship without cause. On the death of an executor the office does not pass to his executor.

An executor to a will in Scotland is called a testamentary executor, to distinguish him from the next of kin, who are styled executors. The term executor is given to all who manage the estate of a deceased, whether appointed by will or by authority of the court. The former are called executors nominate; the latter, executors dative. All executors must, before entering upon their duties, obtain *Confirmation* (q. v.) from the Commissary Court. This is equivalent to probate in England. But in Scotland, no right vests in the executor until after confirmation, except a title to sue, being exactly the reverse of the English rule. An executor acting without confirmation is called a *Vitious Intromitter* (q. v.). Executors must, on entering upon their office, exhibit a full inventory of the whole movable estate of the deceased. An executor is only liable to the extent of the inventory. He is not bound to pay interest on the funds in his hands unless they bore interest before confirmation, or unless he is guilty of undue delay in administering the estate. He is not bound to pay the debts for six months after the death of the deceased. But, as in England, the expenses of the funeral and confirmation are entitled to immediate payment. Servants' wages and a year's house-rent have also a preferable claim. An executor is entitled to claim one-third of the *Dead's Part* (q. v.), after deducting debts. But should he receive a legacy, he is bound to impute that towards payment of his claim.

EXE'CUTORS, in Scotland, the heirs *in mobilibus* of a person deceased. They are the whole next of kin in the nearest degree in blood; but where the heir to the heritage is one of the nearest of kin (e. g., the oldest son), he is not entitled to share in the movables without collation (q. v.). The order of succession among executors is first descendants; then collaterals, or brothers and sisters, and their children; and lastly, ascendants, i. e., the father and those claiming through him. But the mother and her family, till recently, were not allowed to succeed to her own child *ab intestato.* This harsh rule was so strictly carried out, that where there were no relations by the father, the crown succeeded as *ultimus hœres*, to the exclusion of the mother.

By 18 Vict. c. 23, the law of succession to movables has been in some degree altered. On the death of an intestate leaving no issue, his father, if he survive, is entitled to take one-half of the movable estate, in preference to brothers and sisters. If the father be dead, the mother takes a third. No further provision, however, is made for the mother in case she is the only surviving relative. It is to be presumed, therefore, that the other two-thirds would still go to the crown. See Succession, Movable.

EXE'CUTORY DEVISE, in English Law, is such a limitation of a future estate or interest in lands or chattels (though, in the case of chattels, it is more properly a bequest) as the law admits in the case of a will, though contrary to the rules of limitation in conveyances at common law (Blackstone, *Comm.* ii. 334). By common law, a freehold cannot be limited on a freehold, as an estate to A and his heirs; but if he die before he attain the age of 21, then to B and his heirs. Nor can an estate be given to commence at a time uncertain, as to A when he returns from Rome. But though these limitations would be void in a deed, common law will sustain them as executory devises. This form of limitation is restrained by the law against Perpetuities (q. v.), which requires that the estate must take effect within a life or lives in being and twenty-one years after. The law will not interpret a limitation as an executory devise, if it can be otherwise sustained. Whenever, therefore, a future interest in land is so devised as to fall within the rules laid down for the limitation of contingent remainders, such devise will be construed as a contingent remainder, and not as an executory devise (Cruise, *Digest*, vi. 369). An executory devise, unlike a remainder, cannot be defeated by any act of the first taker or devisee; when, therefore, an absolute power of disposition is in the first taker, the limitation over is not an executory devise. Within the period allowed for these estates, an executory devise constitutes a species of estate tail; and for this purpose, it is frequently used in America.

EXEGE'SIS (from Gr. *eks*, out of, and *ēgeomai*, I lead) properly signifies the exposition or interpretation of any writing, but is almost exclusively employed in connection with the interpretation of Sacred Scripture, to which, therefore, the subjoined remarks specially apply. The expositor or interpreter is called an *exegete*. To interpret a writing, means to ascertain thoroughly and fundamentally what are the conceptions and thoughts which the author designs to express by the words he has used. For this purpose, it is necessary, in regard to books written in a foreign language, that the exegete should know well, first, the precise signification of the words and idioms employed by the writer. This is termed *grammatico-philological* exegesis. In the next place, he must be acquainted with the things denoted by these words, and also with the history, antiquities, and modes of thought of the nation. This is termed *historico-antiquarian* exegesis. Both together constitute *grammatico-historical* exegesis. When only an exposition of the system of thought contained in a writing is sought after, this is termed *doctrinal* or *dogmatic* exegesis; while the investigation of a secret sense, other than that literally conveyed by the words of a writing, is termed *allegorical* exegesis. But if a writing is regarded from a practical point of view, and in reference to its bearing upon life and manners, the exposition is termed *moral* exegesis. The complete and coherent exegesis of a writing forms what is called a *commentary*, but, if restricted to certain difficult words or knotty points, the elucidations are termed *scholia*. The scientific exhibition of the rules and means of exegesis is called *Hermeneutics* (q. v.). In the earliest ages of the Christian Church, the allegorical method of exegesis prevailed. By the Alexandrian school in particular, it was greatly abused. Origen, however, the greatest of this school, deserves high credit for endeavouring to secure a basis for grammatical exegesis, by a sharp separation of the literal, the moral, and the mystical sense of Scripture. Besides the Alexandrian school, the Syrian historico-exegetic school had many adherents in the East. Among these may be mentioned Cyril of Jerusalem, Ephraim Syrus, John Chrysostom, and Theodorus of Mopsuestia. First, towards the end of the 4th, and during the 5th centuries, a narrowing of the principle of the free interpretation of Scripture begins to be observable, through the rapid development of monkery and the hierarchical system; in consequence of which, the importance of the classic writers was undervalued, and the study of them ultimately abandoned in the Western Church, while a feeling of superstitious reverence, wholly unintelligent and unscriptural, grew up for the letter of the 'Word,' and exegesis, if employed at all, was employed simply to bolster up preconceived views. By and by, independent exegesis was supplanted by the well-known *Catenæ*, consisting of expositions of books of Scripture strung together from the writings of the older church Fathers. In the East, the first of these was got up by Procopius, 520 A.D.; in the West, by Primasius, 550 A.D. Although much was done for the exegesis of the Old Testament by eminent Jewish scholars, such as Solomon Jarchi, Aben-Esra, and David Kimchi, Christian theologians for the most part, knowing only the text of the Vulgate, stuck, during the dark ages, to the interpretations of the Fathers. First in the 12th, 13th, and 14th centuries, efforts were made by individual scholastics, especially by Abelard, St Bernard of Clairvaux, Thomas Aquinas, and Nicholas of Lyra, to re-introduce something like a grammatico-historical exegesis of Scripture. But it was mainly to the great revival of letters in the 15th c., and the humanistic scholars whom it produced, such as Laurentius Valla, Erasmus, &c., that an advance in exegesis was owing. The Complutensian Polyglott also exercised a great and beneficial influence. Shortly after, the Reformation gave an impulse to exegesis, so powerful, that it is felt at the present day; and, indeed, its effect is far more visible in the recent biblical criticism of Germany than it was in the days of Luther himself. The desire for the unfettered exegesis of Scripture strongly animated the reformers, but, in fact, the long black night of ignorance—known as the dark and middle ages—has influenced them too, and disqualified them for framing at once a comprehensive exegetical science. It required a couple of centuries to recover from the effects of medieval ignorance. The more important Lutheran exegetes are: Luther, Melancthon, Brenz, Joach. Camerarius, Strigel, Chemnitz, &c.; of the Reformed or Calvinistic school may be mentioned Calvin, Zwingli, Œcolompadius, Bucer, Beza, Bullinger, Grotius, Clericus, &c.; and of the Roman Catholics, especially Paul Sarpi. During the 17th c., the exegesis of Scripture was for the most part at a stand still, but about the middle of the 18th c. it suddenly revived. This revival is due principally to Joh. Aug. Ernesti (q. v.), and J. Sal. Semler (q. v.), who established new principles of criticism and hermeneutics, through which grammatico-historical exegesis once more began to make its appearance. The labours of Wetstein and Kennicott in regard to biblical MSS. were of immense service. Since their day, on to the present, criticism has been constantly at work on the writings of the Old and New Testament. Cognate languages have been more and more profoundly studied; the antiquities of the East, of Egypt, Assyria, Arabia, and other countries, have been investigated, and brought to bear on the subject; the manners and customs which prevail in these lands, and which, in some of them, have prevailed from time immemorial; the laws that determine the growth of civilisation in nations, and enable us to enter into and comprehend the condition of mind peculiar to races in a primitive stage of development, and to appreciate their modes of thought, and to weigh the value of their literary and religious records—all these have received, and are still receiving careful attention at the hands of numerous scholars, so that it is not too much to say that we are at the present day better fitted—so far as outward helps go—to understand the real meaning of Scripture, than those who have lived at any other period subsequent to its composition. Among the eminent names in the recent development of biblical exegesis are F. A. Wolf, J. Dav. Michaelis, Eichhorn, Gesenius, Wahl, Bretschneider, Winer, Rosenmüller, Hitzig, Hirzel, Ewald, Umbreit, De Wette, Knobel, Lücke, Paulus, Meyer, Olshausen, Hengstenberg, &c. The influence of the *grammatico-critical*, and *critico-historical* exegesis of modern Germany, is only beginning to make itself felt in this country. The most important contributions to the science recently made by British scholars, are those by Conybeare and Howson, Alford, A. P. Stanley, Jowett, &c.

EXELMANS, REMY JOSEPH ISIDORE, COMTE, a distinguished French general, was born at Bar-le-duc, 13th November 1775. He entered the army in 1791, was promoted to the rank of captain in 1799, served with distinction in the campaign of Naples under Macdonald and Championnet, and in 1801 was attached as aide-de-camp to the staff of Murat. In 1808, while with Murat in Spain, he was arrested, and sent to England, where he remained a prisoner for three years. He was with Napoleon in the Russian campaign in 1812, for his brilliant conduct in which, the Emperor created him general of division, September 8th of the same year. E. seems to have been equally esteemed under every successive government. On the fall of Napoleon, he was for some time banished from France, but was permitted to return in 1819. In 1831 Louis Philippe restored his titles and rank. Louis Napoleon named him

Grand Chancellor of the Legion of Honour, and on March 11, 1851, raised him to the dignity of *Maréchal de France*. On the 21st July 1852, E. had a bad fall from his horse, from the effects of which he expired on the following night.

E'XERCISE, a very important element of medical Regimen (q. v.), both in the preservation of health and in the cure of disease. To preserve all the functions of the body in health, it is necessary to secure their due and regular action or exercise; to allow of complete inaction of any part or function, is to initiate disease, and probably even structural change, or atrophy. Hence the development of the muscular system, of the secretions, and even of the mind and its organ, the brain, require the more or less regular use of exercise, either in the form of productive and useful work, or by means of artificially devised methods calculated to serve a like purpose in regard to the economy. Thus, scholastic education is exercise for the mind; Gymnastics (q. v.), for the body. Both these means enter largely into enlightened medical practice, though they are often too much neglected. Exercise, to be beneficial, must be attended with rest, to allow the tissues which are worn away during vital action to be restored; but rest of one part or organ is often best secured by bringing others into activity; so that, except during sleep, there is rarely a necessity for a complete and simultaneous disuse of all the faculties, or even of those most immediately under our control. The best regulated life is that which secures due and proportionate exercise at intervals for all the functions, mental as well as bodily.

E'XETER (the *Cær-Isc* of the Britons, the *Isca Damnoniorum* of the Romans, *Exancester* of the Saxons), a city, episcopal see, separate county, parliamentary and municipal borough, and river-port, in the south-east of Devonshire, and the capital of that county. It lies on an acclivity on the left bank of the Exe, 10 miles north-west of its mouth, 170 miles west-south-west of London, and 73 miles south-west of Bristol. It is on the whole well built and clean, and has two main lines of street meeting near the centre. There are some fine squares and terraces. The Guildhall has a singular portico, added in 1593, and projecting into the street. Exeter cathedral, a cruciform structure, magnificent in its ornamentation, was erected 1112—1478. It measures 408 by 140 feet, and has a nave 175 feet long, with two aisles, a transept ending in two Norman towers 145 feet high, a choir, 13 chapels, and a consistory court. The west front has a profusion of niches and carved figures, and the west window has beautiful tracery. In the choir is a dark array of oaken stalls and canopies, besides the bishop's throne—an exquisite airy fabric towering 52 feet to the roof of the choir. In one of the towers is the great Tom of Exeter or Peter's Bell, 12,500 lbs. weight, and a large curious antique clock. E. has a large floating ship-basin, 917 feet long, 90 to 110 feet broad, and 18 feet deep; and a ship-canal, 15 feet deep and 30 feet broad. This canal extends 5 miles, and terminates at Turf, about 2 miles from the head of the estuary of the Exe. E. has magnificent nurseries, and exports dairy, farm, and orchard produce from a neighbourhood rich in such products. Pop. (1861), including St Thomas, which is separated from the city by the river, about 41,000. The town sends two members to parliament. In 1860, 789 vessels, of 78,227 tons, entered and cleared the port. E. was anciently the chief residence of the West Saxon kings. Exeter bishopric, fixed here in 1050 by Edward the Confessor, includes Devon and Cornwall, 23 deaneries and 588 benefices. The city was formerly surrounded with walls and strongly fortified. On a height to the north of E. are the ruins of Rougemont Castle, built by William I., on the site of one said to be as old as Cæsar's time. Many Roman and Greek coins have been found in E., besides tesselated pavements, fragments of columns, and small bronze statues.

EXETER COLLEGE, Oxford. This college was founded in 1315, by Walter de Stapledon, Bishop of Exeter, who removed from Hart Hall to the present site of Exeter College, a rector and twelve fellows. In 1404, Edmund Stafford, Bishop of Salisbury, added two fellowships, and gave the college its present name. Sir William Petre, in 1565, founded eight more; and in 1636, Charles I. annexed one more for the islands of Jersey and Guernsey. In 1770, Mrs Sheers left certain rents for the establishment of two fellowships. All these fellowships were originally appropriated to various archdeaconries or counties, especially in the west of England. A peculiarity in this college was, that the above foundations, though generally called fellowships, were, strictly speaking, only scholarships. Important changes were introduced by the rector and fellows, under the authority of 17 and 18 Vict. c. 81, and approved of by the commissioners appointed to carry out that act. The number of fellowships was reduced to 15—all open without any restriction as to place of birth. The revenues of two fellowships were divided among the rectorship and the 15 fellowships. The remaining 8 fellowships were devoted to the foundation of 22 scholarships; ten open without restriction; ten limited to persons born, or for three years educated in the diocese of Exeter; and two limited to persons born in any of the Channel Islands. Several exhibitions also are attached to the college; and there are about 16 benefices in the gift of the Society. The number of names on the books in 1861 was about 540.

EXETER or **EXON DOMESDAY.** See Domesday Book.

EXETER HALL, a large proprietory building, on the north side of the Strand, London, is 131 feet long, 76 feet wide, and 45 feet high. It was completed in 1831, and contains upwards of 3000 persons. It is let chiefly for religious assemblies, and is in great request during the 'May Meetings' of the several religious societies. It is also let as a concert-room, and has been the scene of many great musical fêtes.

EXHAU'STIONS, Method of, is a mode of proving mathematical propositions regarding quantities by continually taking away parts of them. The method was frequently employed by the ancient geometers; its fundamental maxim, as stated by Euclid, being that those quantities are equal whose difference is less than any assignable quantity. Euclid employs the method in Book x. Prop. 1; and it was used by Archimedes to prove that the area of a circle is equal to that of a right-angled triangle whose one leg adjoining the right angle is the radius, and the other the circumference. In this ancient method we may see the rudimentary form of the modern transcendental analysis.

EXHIBITION, Art. See Art Exhibitions.

EXHIBI'TION, Industrial (Fr., *Exposition de l'Industrie*). Exhibitions of this kind originated in France, where the first took place in 1798, at the suggestion of the Marquis d'Avèze. It was held in the Maison d'Orsay and its grounds; but it appears to have been rather a collection of such objects of French art-manufacture as could be borrowed from their owners, than an assembling together of competing artists and manufacturers with their respective works. It is, nevertheless, interesting as a historical fact, having been the first of these displays of which we have any clear and authentic record; and its more important effect was to familiarise the French mind with national exhibitions.

In the same year, another exhibition was held in Paris, on a grander scale, and with considerable success. It embraced all kinds of manufactures; whereas that at the Maison d'Orsay was chiefly devoted to those of artistic merit; hence the credit has been claimed for the latter one of being the commencement of industrial exhibitions, certainly, however, without justice or truth.

In consequence of the obvious utility of the exhibitions of 1798, another was held in 1802, under the consulate of Napoleon, with equal success, and thus led to the establishment of triennial exhibitions, which were, with occasional interruptions from political causes, held until the novel idea was originated in this country, in 1850, by His Royal Highness the Prince Consort, of holding a universal exhibition open to all comers.

That was not, however, the first industrial exhibition held in the United Kingdom. The Royal Dublin Society, possibly from the French sympathies of Ireland during the Revolution, as early as 1829 adopted the plan of triennial exhibitions, which was several years before any other part of the United Kingdom; they took place in the Society's rooms in Dublin. Like the French, however, they at first comprised only specimens of native industry.

In England, the first well-organised exhibitions were those of the Cornish Polytechnic Society, in which were illustrated the mineral wealth of the county, and its mechanical appliances for mining purposes, &c. These were continued annually without intermission until 1850. Manchester, Birmingham, and Liverpool also held local exhibitions; that of the second town was by far the most important, and is fairly entitled to be considered the prototype of the 1851 exhibition; indeed, it is by no means certain that both did not arise from the same cause—the agitation in favour of a great national exhibition, commenced by His Royal Highness the Prince Consort and the Society of Arts as early as 1848. The Birmingham exhibition was held in 1849.

The Manchester exhibitions were the earliest held in the great English industrial towns, but they, like those which were held in the Mechanics' Institutes of Liverpool and Leeds, and subsequently in the Collegiate Institution of Liverpool, had a mixed character, the illustrations of art and manufactures being pretty well mingled with objects of natural history and various other curiosities, for the amusement of the visitors. That of Birmingham, however, was much more completely devoted to the true objects of industrial exhibitions; it was held in the spacious apartments of Bingley Hall, and was a great success, especially when it is borne in mind that it was carried out solely by private enterprise. The multitudinous manufactures of that wonderful place were amply illustrated, and a most careful attention was paid to the exhibition of those objects of art which were best calculated to foster the taste of designers, and others, whose duty it was to give refinement to the masses, by gradually improving those objects of necessity and ornament in everyday use. The success of the Bingley Hall Exhibition no doubt acted most beneficially upon that of 1851 which was approaching, for it gave an unmistakable impetus to the industrial pursuits of the people of Birmingham, and through them acted widely upon others.

The first metropolitan movement in favour of holding a national exhibition in this country was immediately after the French Exposition of 1844, the results of which were so beneficial, that several applications were made to the government requesting that the matter should be officially taken up. The government, however, as usual, proved itself to be simply executive, and did nothing.

In the meantime, the Society of Arts tried the experiment of holding exhibitions annually in their own building in the Adelphi; but these, though eminently successful, were not sufficient to satisfy those with whom a national exhibition had become a fixed idea. In 1849, His Royal Highness devoted himself thoroughly to this object, and made the happy suggestion of throwing open the exhibition to all nations. The plans, too, were suggested for raising the necessary funds and other essential points, and the scheme soon took a tangible form; and it was finally determined by the government to issue a royal commission, which was gazetted January 3, 1850. From this moment the Great Exhibition was fairly launched. In order to enable the commissioners to enter into contracts, and otherwise incur obligations, it was necessary to procure subscriptions to a guarantee fund. The subscription-list was opened by the Queen for £1000. The exhibition took place in a vast structure of iron and glass, called the Crystal Palace, in Hyde Park, London. The edifice, planned by Joseph Paxton (q. v.), was opened by Her Majesty, May 1, 1851. It was 1851 feet long by 456 feet broad, and 66 feet high; the entire area covered being 13 acres. On the ground floor and galleries there were 8 miles of tables. The glass employed in the structure weighed upwards of 400 tons. The number of exhibitors exceeded 17,000. The exhibition was open 144 days, being closed October 11. The entire number of visitors was 6,170,000, averaging 43,536 per day. The largest number at one time in the building was 109,760, on October 8. The entire money drawn for tickets of admission amounted to £505,107; and after all expenses were defrayed, a balance of £150,000 was left over; so that there was no call on those who subscribed the guarantee fund. Popularly, this great exhibition was properly enough called the World's Fair, for it attracted visitors from all parts of the world. When the exhibition was over, the building was cleared away.

The importance of this celebrated exhibition was so obvious, that other countries became anxious to have something of the same kind. An exhibition was held in Cork in 1852; although not of an international character, it was the first for which any special structure was erected in Ireland, and deservedly gave great satisfaction. The home manufactures of Ireland were admirably displayed in conjunction with those of other parts of the kingdom. Dublin got up an international exhibition in 1853, and by the princely munificence of Mr Dargan, was enabled to make an admirable display, in a building of great beauty. The Dublin Society added a new feature—high art was associated with industrial art, and a gallery of pictures, the finest ever brought together in this kingdom before, was there exhibited with great success. In the same year, a similar exhibition took place in a crystal palace in New York. France, in 1855, repeated the same experiment with immense success; both the industrial and the art collections were such as the world had never seen before. Though wanting the imposing magnitude of the Hyde Park building, the contents of the Palais de l'Industrie, with its detached Picture-gallery and its Annexe, were of the choicest description, and reflected the highest credit on French taste and skill. Several other continental nations followed with various success. In Europe, it has now taken root, and every country looks upon an exhibition of its industrial resources and productions, from time to time, as a grand necessity which must be met. In 1861, there was an exhibition at Haarlem, in which a vast assemblage of admirably arranged specimens illustrated every industry followed by the most industrious and philosophical people of Europe. In Belgium, also, a small industrial exhibition was held in 1861 at Brussels, consisting chiefly, however, of articles of use, in which tasteful design was the chief consideration.

Such is a very brief outline of the history of these exhibitions, which now form a prominent feature in this era of the history of civilisation. The fulness of their effects is still to be seen, but, judging of the beneficial effects they have already produced, it is not too much to say, that they appear destined to help most largely in diffusing a love of industry, and a peaceful emulation over the whole globe. Commerce may have its weak points, even its meannesses, but it cannot be denied that few of the occupations of man are more humanising, or tend more to teach the value of peace and good-will; and if this be conceded, certainly nothing can more assist it than these great gatherings, in which each nation shews its own specialities, and gives to others the ideas which it has accumulated through its centuries of progress in industrial art. Like the social interchange of thought, this interchange of inventive genius brings out new talents; and succeeding generations will reap a rich harvest of results from our industrial exhibitions. To mark the advance in the arts since 1851, and promote manufacturing and commercial activity, an exhibition, the greatest yet achieved, is to take place at Kensington, London, in 1862; and in which are to be comprehended paintings in a high style of art from all countries. Some notice will be taken of this expected magnificent display in our Supplement. See *Official, Descriptive, and Illustrated Catalogue of the Great Exhibition of* 1851 (3 vols.); also *Reports by the Juries* (2 vols.); and likewise the magnificent set of works printed for the commissioners (13 vols. folio).

E'XMOOR FOREST, a moory, mostly uncultivated waste, consisting of dark ranges of hills and lonely valleys, 14 square miles in area, in the west of Somersetshire and north-east of Devonshire. It is bordered by deep wooded glens. The hills rise in Dunkery Beacon to 1668 feet, in Chapman Barrow to 1540, and in Span Head to 1510. Devonian slates, with some new red sandstone in the north, form the substratum. It is covered with heath, interspersed with juniper, cranberry, and whortleberry, with much meadow-land. Throughout this tract there is a native breed of ponies, known as Exmoor ponies, reputed to be stout and hardy. Since 1851, E. has become an iron-mining district. The river Exe, and its tributary the Barle, rise in Exmoor. It is subject to winds and mists.

E'XMOUTH, a town in the east of Devonshire, on the left bank of the mouth of the Exe, 10 miles south-east of Exeter. It stands at the base and on the slope and top of a hill rising from the sandy estuary of the Exe. It is noted for its mild climate. From about 1700, it was the chief watering-place on the Devon coast, till the rise of Torquay. There is a fine promenade on a sea-wall 18 feet high. The Haldon ridge of hills on the east, 800 feet high, protects it from the east winds. Here Sueno the Dane landed in 1003. It was taken by the royalists in 1646. Pop. (1861) 6025.

EXMOUTH, EDWARD PELLEW, VISCOUNT, a famous naval commander, was born at Dover, April 19, 1757. He entered the navy when 13 years of age, and first attracted notice by his gallant conduct in the battle on Lake Champlain, October 11, 1776. In 1782, he attained the rank of post-captain. In 1793, having been appointed to the command of the *Nymphe*, a frigate of 36 guns, he encountered, and, after a hard-fought battle, captured *La Cleopatre*, a French frigate, which carried the same number of guns. For this victory, he was knighted. In 1799, he received the command of the *Impétueux*, 78 guns, and was sent to the French coast, where many of his most brilliant actions took place. In 1804, Sir E. Pellew was advanced to the rank of Rear-admiral of the Red; in 1808, to that of Vice-admiral of the Blue; and in 1814, he was raised to the peerage, with the title of Baron Exmouth of Canonteign, Devonshire, with a pension of £2000 a year. In 1816, he was sent to Algiers, to enforce the terms of a treaty regarding the abolition of Christian slavery, which the Dey of Algiers had violated. With a combined fleet of 25 English and Dutch vessels, he bombarded the city for seven hours, and inflicted such immense damage, destroying all the Algerine fleet and many of the public buildings, that the Dey consented to every demand. E., who had been wounded in the leg and cheek in this action, received on his return to England the thanks of both Houses of Parliament, and was promoted to the rank of viscount, 10th December 1816. In 1821, he retired from public service, loaded with honours. He died 23d January 1833.

EXOCETUS. See FLYING-FISH.

E'XODUS ('the departure'), the name given to the second book of the Pentateuch. It may be regarded as composed of two parts—the first historical, and the second legislative. The historical extends to the end of the 18th chapter. It embraces a narrative of the various preparations, natural and supernatural, made under the providence of God for the deliverance of the Israelites from their bondage in Egypt, and also describes the accomplishment of their deliverance, and the journeyings of the people in the wilderness as far as Mount Sinai. The legislative is devoted to a minute and elaborate account of the institution of the theocracy. The book presents us with three aspects of Hebrew history. We have, first, a picture of a people enslaved; second, of a people redeemed from bondage; and third, of a people sanctified and set apart to the service of God. The period embraced by the history of the book is usually reckoned at 142 or 145 years, which number is obtained as follows: From the death of Joseph to the birth of Moses, 60 or 63 years; from the birth of Moses to the departure from Egypt, 80 years; and from the departure out of Egypt to the erection of the tabernacle, 1 year. It cannot be denied, however, without wildly violating all the ordinary laws of the increase of population, that this is much too short a period to account for the existence of such a number of Hebrews as left Egypt—viz., 600,000, exclusive of women and children—i. e., in all, at least 2,500,000. Those who went down into Egypt with Jacob were 'threescore and ten souls,' and in 215 years, these, though prohibited from intermarrying with the Egyptians, had amounted to between two and three millions. The writer of Exodus, indeed, says (chapter xii., verse 40) that 'the sojourning of the children of Israel, who dwelt in Egypt, was 430 years,' adding that they left the land 'even the selfsame day' on which they had entered it. This statement, however, does not seem to harmonise with the author's previous narrative, and is certainly inconsistent with the language of the Apostle Paul, who says (Gal. iii. 17) that the law was given 430 years after the covenant with Abraham, which took place about 215 years before Jacob and his sons went down into Egypt, so that, according to this view, the Israelites could only have been in Egypt 215 years. This is the number commonly accepted; but it is not wonderful that some writers should affirm, that 'it would be more satisfactory if we could allow 430 years for the increase of the nation in Egypt rather than any shorter period.' A still longer period would undoubtedly afford additional satisfaction; and Bunsen, in his *Ægypten's Stelle in der Weltgeschichte*, endeavours to shew that the Israelites were in Egypt for *fourteen* centuries instead of two, and that the number 215 only indicates the period of oppression, the time when they were 'evilly entreated.' This conclusion is, of course, arrived at by the application of principles of criticism not generally recognised in the schools of British theology; but there seems no avoiding the conclusion, that the usual chronology is hopelessly wrong.

May it not be that the interval which elapsed between the death of 'Joseph and all his brethren, and all that generation' (Exodus i. 6), and the period when there arose up a new king over Egypt which knew not Joseph (Exodus i. 8), was much longer than we suppose? The passage itself in Exodus seems to favour this idea; for the intervening verse (Exodus i. 7) speaks of the children of Israel 'increasing and multiplying, and waxing exceeding mighty, and filling the land,' without any reference at all to the time occupied in this process; and such words are certainly more applicable to a series of centuries than of years, while centuries, besides, would harmonise better than years with the statement that the Egyptian king knew not (i. e., had forgotten all about) Joseph. The only grave objection to this otherwise extremely probable hypothesis, is its incompatibility with the statement of St Paul; an objection, however, which Luther would not have found insurmountable, for in an exactly similar case he said of the inspired Stephen that 'he was no historian, and did not trouble himself about particulars.'—*Zu Apostelgesch*, vii. Bd. 1, 1160.

In explanation of the chronological difficulty, the confusion resulting from the use of *letters* as numerals in Hebrew MSS. has been urged; and this is notoriously a fertile source of error and contradiction, which rationalistic critics have not sufficiently kept in mind. To adduce such a reason, however, would be unavailing in the present case; for if it could be proved that the period stated in Exodus may have been abbreviated through the negligence of some careless transcriber, or otherwise, and thus an approximation be made to the *fourteen* centuries of Bunsen, this would only place the writer of the Pentateuch in more visible antagonism with St Paul himself. The date of the exodus is fixed by Usher at 1491 B. C.; by the Septuagint, at 1614 B. C.; by Hales, at 1648 B. C.; by Wilkinson, about 1495 B. C., in the reign of Thothmes III.; and by Bunsen, as late as 1320 or 1314 B. C., in the reign of Menephthah, in the latter of which years Manetho gives what appears to be the Egyptian version of the event. The genuineness and authenticity of the book of E. have been sharply criticised in modern times; but in fact, as early as the time of Josephus (*Ant.* ii. 16), there were Jews who looked upon the miracle of the crossing of the Red Sea, &c., as fabulous. Among the theologians who have questioned the integrity of E., are Von Lengerke, Stähelin, De Wette, and Knobel, all of whom find traces of an older and a later author, the former of whom they call Elohistic, and the latter Jehovistic. Their objections have been replied to by Hengstenberg, Hävernick, &c., who endeavour to shew that the distinction is artificial, and the attempt to follow it out in detail a failure. See PENTATEUCH.

EXO'GENOUS PLANTS, or **EXOGENS** (Gr. *exo*, outwards; *gennao*, to produce), are those in which the woody substance of stem increases by bundles of vascular tissue added externally. The exogenous stem contains a central *Pith* (q. v.), from which *medullary rays* proceed to the Bark (q. v.), and the bark is very distinct from the fibro-vascular or woody part which it surrounds. The exogenous is thus very different in structure and manner of growth from the endogenous or the acrogenous stem. Amidst the cellular substance of the young stem, when it has developed itself from the seed, woody cords are seen connecting the cotyledons, and afterwards the leaves, when these appear, with the root, in the central axis of which they join. A section of the stem exhibits the cellular substance traversed by vascular bundles (woody fibre), which in the section are more or less wedge-shaped, radiating from the centre, but yet not prolonged into the centre itself, which, even to the greatest age of the stem, remains occupied by the cellular pith. Additional bundles are interposed, as growth proceeds, diminishing the proportion of cellular substance in the stem, yet without these bundles ever becoming so compacted together as to cut off the communication between the cellular centre of the stem and its bark, which is maintained by means of the medullary rays, often, indeed, imperceptible to the naked eye, but always present even in the hardest and most close-grained wood. The woody layers which are formed in successive years, as new leaves and branches are developed, are formed amidst the *Cambium* (q. v.), into which the woody fibres of the new leaves descend, between the bark and the former wood. Thus the concentric circles are formed, usually one for each year's growth, distinguishable even in the most matured timber, and by which the age of trees is very commonly computed. The beginning of each new layer is generally marked by a greater abundance of *porous vessels*, the openings of which are conspicuous in the transverse section. In pines, the line of separation between the layers is marked by greater density of texture, and often by deeper colour. The age of trees cannot, however, be calculated with perfect certainty from the concentric circles of the stem, as any circumstance which temporarily arrests the growth in any summer, may produce an effect similar to that ordinarily produced by the change of seasons; whilst in the trees of tropical countries, at least where the wet and dry seasons are not very marked, concentric circles are often not to be discovered.

The structure of the branch of an exogenous tree perfectly corresponds with that of the stem. The vascular bundles of the stem or branch form a loop where a leaf begins, and those of the leaf and its axillary bud spring from the loop. The roots of exogenous plants have not a central pith like the stem, but in a few trees, as the horse-chestnut, the pith is prolonged to some extent into the root.

Anomalies are not unfrequently to be met with in the structure of exogenous stems, and particularly among the twining woody plants of tropical countries. There are also very many herbaceous plants, in which, although the structure agrees with that of an exogenous tree in its first year, no further development is ever attained; whilst in many, even this is very imperfectly reached; but yet these are on other accounts unhesitatingly classed with exogenous plants. The exogenous stem and dicotyledonous seed are so constantly found together, that the designation exogenous plants is often applied to that great division of the vegetable kingdom, which is also called dicotyledonous. See Botany. Exogenous plants are also characterised by a particular mode of germination, with reference to which they are called *exorhizal* (Gr. *exo*, outwards; *rhiza*, a root), the radicle simply lengthening, and not having to break through the coat of the embryo. The leaves of exogenous plants generally exhibit a net-work of veins, instead of the parallel veins characteristic of endogens, and a greater proportional breadth of leaf usually accompanies this reticulated venation.

Exogenous plants are far more numerous than endogens. All the trees and shrubs of Britain, and those of temperate and cold climates generally, are exogenous, as well as very many herbaceous plants of these parts of the world, and many trees, shrubs, and herbaceous plants of the tropics. Almost all trees, except palms and a few *Liliaceæ*, *Pandanaceæ*, and tree-ferns, are exogenous.

E'XORCISM (from *exorkizo*, to conjure), i. e., conjuration in the name of the gods, the term used by the Fathers of the church to denote the act of conjuring evil spirits, in the name of God or Christ, to depart out of the person possessed. The first Christians adjured evil spirits in the name of Jesus Christ, who had conquered the devil; but as the opinion was at the same time entertained, that all idolaters belonged to the kingdom of Satan—who suffered himself to be worshipped under the form of idols—it was customary to exorcise heathens previous to their receiving Christian baptism. After Augustine's theory of original sin had found acceptance in the 5th c., and all infants were regarded as belonging to Satan's kingdom, exorcism became general at the baptism even of Christian children. Following the practice of the Roman Catholic Church, Luther retained exorcism, but it was laid aside by the Reformed Church. Although abandoned by illustrious and orthodox Protestant theologians, such as Chemnitz and Gerhard, or deemed unessential, and in modern times done away with by the 'Protestant' Church, the practice has been recently revived by the Old Lutheran or High-Church party.

In the Catholic Church, the function of exorcism belongs peculiarly to one of the so-called 'minor orders.' See Orders. Our Lord having not only himself in person (Matt. ix. 32, Mark i. 25, Luke iv. 35, viii. 29) cast out devils, but having also given the same power to his disciples, it is believed to be permanent in the church. Of its exercise in the early church, both in relation to 'energumens,' or persons possessed, and in the administration of baptism, there are numerous examples. Tertullian and Origen speak of it as of ordinary occurrence, and the council of Carthage, in 255, alludes to its use in baptism. The rite of exorcism is used by the modern church in three different cases: in the case of actual or supposed demoniacal possession, in the administration of baptism, and in the blessing of the chrism or holy oil, and of holy water. Its use in cases of possession is now extremely rare, and in many dioceses is prohibited, unless with the special permission of the bishop. In baptism it precedes the ceremony of applying the water and the baptismal form. It is used equally in infant and in adult baptism, and Catholic writers appeal to the earliest examples of the administration of the sacrament as evidence of the use of exorcism in both alike. The rite of baptismal exorcism in the Roman Catholic Church follows closely the Scriptural model in Mark viii. 33. The exorcisms in the blessing of the oil and water resemble very closely the baptismal form, but are more diffuse.

EXOSMOSE. See Endosmose.

EXOSTEMMA, a genus of American trees and shrubs of the natural order *Cinchonaceæ*, nearly allied to *Cinchona*. Several species yield febrifugal barks, which, however, do not contain the cinchona alkaloids. The most valued of these barks are Caribbee Bark (q. v.) and Saint Lucia Bark, the latter of which is the produce of *E. floribunda*, a native of the more mountainous parts of the West Indies.

EXOTE'RIC. See Esoteric.

EXO'TIC PLANTS, or **EXOTICS** (Gr. coming from abroad), cultivated plants originally derived from foreign countries. The term is most frequently applied to those of which the native country differs so much in soil or climate from that into which they have been conveyed, that their cultivation is attended with difficulty, requiring artificial heat or other means different from those requisite in the case of indigenous plants. The cultivation of many such exotics is carried on with great success in our greenhouses and hothouses; but there are a few which, notwithstanding all the care of the gardener, can almost never be made to flower, and others which, although they flower, seldom produce ripe fruits and seeds. Nor are difficulties of this kind experienced only in the cultivation of those which belong to warmer climates than our own, but sometimes even with the natives of colder regions; thus, the delicious fruit of the *Rubus arcticus*, abundant in the most northern parts of Europe, is scarcely ever to be seen in the gardens of Britain, although the plant grows with sufficient luxuriance.

EXPANSION. See Heat.

EXPECTA'TION (Lat. *expectatio*, a waiting, or looking out), i. e., the treatment of disease without active remedies, by simply observing its progress and averting its consequences through physiological means; as, for instance, when a Fracture (q. v.) is treated by keeping the ends of the broken bone in their proper place, until the natural processes of repair are completed. Expectation is in this and other cases obviously a quite different thing from inaction, or the systematic doing of nothing, with which it has been sometimes confounded.

EXPECTATION OF LIFE. See Probability.

EXPECTATION WEEK is the name given to the period elapsing between Ascension Day and Whitsunday, because during this time the apostles continued praying in earnest expectation of the Comforter.

EXPE'CTORANTS (Lat. *ex*, out of, and *pectus*, the breast), medicines given to carry off the secretions of the air-tubes. See Bronchi, Bronchitis. The principal expectorants are antimony, squill, ipecacuanha, senega, balsam of tolu, lobelia, gum ammoniac, asafœtida, galbanum, &c.

EXPECTORA'TION (see Expectorants), the mucus or other secretion discharged from the air-passages. The examination of expectoration is of the utmost value in the diagnosis of diseases of the chest, as will be seen in their separate description. See Chest, Diseases of; Bronchitis; Pneumonia; Consumption, &c.

EXPENSES or **COSTS OF A LAWSUIT.** The arrangements adopted in England with reference to charges exigible from the parties to lawsuits are stated under Costs. In Scotland, these charges are commonly spoken of as expenses, and in the present article we shall, consequently, confine ourselves to the Scottish practice. In addition to demanding payment of the sum claimed, or performance of the alleged obligation where it has no reference to a pecuniary transaction, the pursuer of an action at law in Scotland almost always asks the court to pronounce decree in his favour for the expense of the proceedings which he has found it, or may find it, necessary to institute. On the other hand, the defender usually demands the expense attending his defence; and the general rule is, that the party found ultimately to be in the wrong has decree pronounced against him for the expense which he has occasioned to his opponent, as well as for the subject-matter of the suit. As it is quite usual for a party to succeed in one branch of his action, and to fail in another; or to occasion unnecessary expense by the unskilful or careless mode in which he conducts some portion of it, even though on the whole he be in the right; the adjustment of the amounts incurred by the parties respectively often involves not only much nicety of calculation, but questions of very considerable legal difficulty. In so far as the adjustment of expenses is a matter of calculation, it is effected by the auditor of the Court of Session, or of the inferior courts. See Auditor, Sheriff Courts. In so far as it involves questions of law, these, if not previously decided by the judge, must be carried back to him from the auditor. If either party means to object to the amount awarded to him by the auditor in his report, he must lodge with the clerk of the process a short note of his objections without argument. A copy of this note must be furnished to the agent for the opposite party, and the court, or the Lord Ordinary, before whom the action depended, may direct the objections to be answered either *vivâ voce* or in writing. Should the objector fail to make good his objection, the expense of discussing it will be laid on him. If the objection has been stated to the auditor, and he has reported it to the court, it does not follow that the expense of discussing it will be laid wholly on the objector, even if unsuccessful. Where an appeal to the House of Lords has been actually presented, and service of an order thereon has taken place, a motion for expenses is incompetent, but a mere intimation of an appeal is not enough to prevent decree for expenses being pronounced. If the agent who has conducted the cause wish it, the decree for expenses will be pronounced in his favour; and the party found liable will not be allowed to plead a counter-claim against the client, as by that means he might prevent the agent from recovering what he very probably has disbursed. The taxation of expenses is said to be between *party* and *party*, and not between agent and client; that is to say, the losing party has to pay only the expenses which have been necessarily incurred in discussing the question between the parties judicially, not the unnecessary expenses which the overanxiety of the successful party may have led him to incur to his own agent. Practically, there are very few cases in which the expenses recovered do cover all the *bonâ-fide* claims of the agent against his client, which is the chief reason why litigation is always attended with expense, even to the winning party.

EXPE'RIMENT and observation are the means by which we extend and confirm our knowledge of nature. An experiment is properly a proceeding by which the inquirer interferes with the usual course of a phenomenon, and makes the powers of nature act under conditions that, without his interference, would never, perhaps, have presented themselves all together. The introduction of experiment distinguishes the modern method of investigating nature from that of ancient times and of the middle ages. It is by this means that physics and chemistry have made such rapid strides within the last two centuries. Through experiment, the investigator becomes master of the phenomena he is considering; for he can contrive to set aside the unessential circumstances that so often conceal the real relations and conditions of things, and make these come out into the light. Experiments exhibited during a lecture on any branch of science are made, not with a view to the discovery of truth, but to aid in the exposition of truths already discovered; they are sometimes called demonstrative experiments.

EXPE'RT (Lat. *expertus*, from *ex* and *peritus*, specially skilled), a man of special practical experience or education in regard to a particular subject—a word commonly applied (after the French) to medical or scientific witnesses in a court of justice, when selected on account of special qualifications, as in the case of an analysis of the contents of the stomach in suspected poisoning. The term is similarly applied to a person professionally skilled in handwriting, for detection of forgery of deeds and signatures.

EXPO'NENT AND EXPONENTIAL. When it was wanted to express the multiplication of unity for any number of successive times by the same number or quantity, e. g., $1 \times 5 \times 5$, or $1 \times a \times a \times a$, it was found a convenient abbreviation to write 1×5^2 and $1 \times a^3$, or simply, 5^2 and a^3; and the numbers, 2 and 3, indicating how often the operation of multiplication is repeated, were called exponents. But the theory of exponents gradually received extensions not originally contemplated, and has now an extensive notation of its own. Thus, $a^0 = 1$, $a^1 = a$, $a^{-2} = \frac{1}{a^2}$, $a^{\frac{1}{2}} = \sqrt{a}$, $a^{\frac{1}{3}} = \sqrt[3]{a}$, $a^{\frac{2}{3}} = \sqrt[3]{a^2}$, or the cube root of the square of a. Also a^x is the xth power of a, x being any number integral or fractional; and, a continuing the same, x may be so chosen that a^x shall be equal to any given number. In this case, x is called the logarithm of the number represented by a^x. Considered by itself, a^x is an exponential. Generally, any quantity representing a power whose exponent is variable, is an exponential, as a^x, x^x, y^x, &c. Exponential equations are those which involve exponentials, such as $a^x = b$, $x^x = c$.

EXPOSURE OF INFANTS. See Infanticide.

EXPRESSIO'NÉ, Con, or **ESPRESSIVO**, Italian terms in music, meaning with expression; impassioned, with pathos. Where the word appears at the beginning of a composition, the piece must be executed throughout with feeling. 'Expressione' frequently appears above certain passages which alone are to be performed so, while the harmony in the accompaniment goes on quietly.

EXTE'NSION, in Logic, is a word put into contrast with another term, Comprehension, and the two mutually explain each other. A general notion is said to be extensive according to the extent of its application, or the number of objects included under it. Thus, Figure is a term of very great extension, because it contains in its compass many varieties, such as round, square, oblong, polygonal, &c. In like manner, European is more extensive than German, man than European, animal than man, organised being than animal. The highest genera are formed by taking in a wider range of objects. Matter and Mind are the most extensive classes that we can form. For, although a higher genus is sometimes spoken of, viz., Existence; to call this a class is to generalise beyond real knowledge, which does not begin till we have at least two actual things to contrast with each other. What can be contrasted only with non-existence, non-entity, or nothingness, is not genuine knowledge: no property can be affirmed of it apart from the thing itself. Matter, in its contrast to mind, is a real cognition; and *vice versâ*, mind in its contrast to matter. These, then, are the most extensive terms that have any real knowledge attached to them. But this property of extension is gained by dropping more and more of the peculiarities of the included individuals; 'organised being,' in order to include both plants and animals, must drop from its signification what is peculiar to each, and mean only what is common to both. In short, these very extensive notions have a very *narrow* signification; it is the less extensive that have most meaning. The meaning of 'Man,' or the number of attributes implied in this generic expression, is large. Everything that goes to a human being—the human form and organisation, the mental attributes of reason, speech, &c.—is expressed by this term, which is on that account said to be more COMPREHENSIVE than animal or organised being. Thus it may be seen that the greater the extension, the less is the comprehension; and the greater the comprehension, the less is the extension. An individual is the term of greatest comprehension, and of least extension. 'Socrates' comprehends all that is common to men and to philosophers, together with all that is peculiar to himself. On the logical uses of this distinction, see Sir W. Hamilton's *Lectures on Logic*, i. 140.

EXTE'NT, in English Law, a writ issuing out of the Court of Exchequer to compel payment of debts to the crown. In order to warrant the issue of this writ, the debt must be a debt of Record (q. v.). Extents are in chief or in aid. The former are issued against the crown debtor, and under it the body, land, and goods may all be taken at once. An extent in aid is issued at the suit of a crown debtor against a person indebted to the crown debtor. On this writ, the chattels only of the person against whom it is issued can be attached. Writs of extent in aid were at one time made the means of great abuse; persons who were not crown debtors were in the practice of assigning debts to the crown, and thereupon obtaining a writ in aid. This practice was stopped by 7 James I. c. 15, forbidding assignments to the crown. Persons then resorted to other means, such as taking the debt in name of the crown, or getting themselves appointed bailiffs for the crown, and in that character procuring the issue of the writ. At last, the practice was finally stopped by 57 Geo. III. c. 117, by which it is enacted that the amount of the crown debt shall be endorsed on every extent in aid, and that any overplus beyond the crown debt shall be paid into court to be disposed of as the court shall direct. By the treaty of Union, extents were introduced into Scotland on revenue matters; but the sheriff is only entitled to take the debtor's movables.

EXTENT (in Scotland). There were no taxes in feudal times. The king was supported by the rents of his property lands, and by the occasional profits of superiority—ward, non-entry, marriage, escheat, and the like—which were known by the general name of Casualties (q. v.). Beyond these, and the expenses which the discharge of his ordinary duties to his superior imposed on him, the vassal was not liable to be taxed. But to this rule there were some exceptions. When it became necessary to redeem the king from captivity, to provide a portion for his eldest daughter, or to defray the expense of making his eldest son a knight, a general contribution was levied. One of these occasions occurred when Alexander III. betrothed his daughter Margaret to Eric, the young king of Norway, and engaged to give her a tocher of 14,000 merks. This sum was far beyond the personal resources of the king, and consequently fell to be levied by a land-tax—land and its fruits being then the only appreciable species of property. But if the tax was to be levied fairly and equally, this could be done only by ascertaining the value of the whole lands in the kingdom, as had been done in England in the time of Edward I. (4 Edw. I. i. anno 1276). Whether this was the first occasion on which a general valuation of all the lands of Scotland had been made, as Lord Kames thought (*Law Tracts*, tract xiv.), or whether there had been earlier valuations of the same kind, as others have supposed (Cranston *v.* Gibson, May 16, 1818, Fac. Coll.), is still a subject of dispute amongst antiquaries. It is certain, however, that the valuation here spoken of was long known as *the old extent*. As such, it is spoken of in the act or indenture of 15th July 1326, by which the parliament of Scotland agreed to give to King Robert Bruce the tenth penny of all the rents of the laity during his life. In this latter act it was provided that such lands as had been wasted by the war should be revalued by an inquest before the sheriff, and the retour, or formal verdict, was so framed as to contain a statement both of the present value of the lands, and of what they were worth 'in the time of peace.' In almost all cases, the new was considerably under the old valuation, a fact which shews how widespread must have been the devastation of that terrible war. The same deplorable fact is brought out by the Extent taken with a view to raise the sum necessary for the ransom of David II. On this occasion, the new extent of the temporal lands scarcely amounted to £25,000, whereas the old extent exceeded £50,000 (Cranston *v.* Gibson, *ut sup.*). But this state of matters was reversed when James I. succeeded in restoring peace and prosperity. Indeed, even before the influence of his personal qualities could have been felt, the condition of the country must have improved, because the extent which was taken in 1424, for the purpose of redeeming him from captivity, shews in general an advance upon that even of the time of Alexander III. In several later cases (1481, 1488, 1535), in which grants were made to the crown, the assessments were levied from temporal lands by a series of new extents, according to present value. During the minority of Mary, the assessments, which were heavy and numerous, were levied according to an old extent, but it is doubtful whether it was the extent of Alexander III., or of David II., or a later one than either. The extents of which we have spoken did not apply to church lands. The share of the subsidies applicable to them was levied according to the value of the benefices as settled by 'Bagimont's Roll,' which was made up in the time of Alexander III. by Benemundus de Vicci, vulgarly called Bagimont. Cromwell introduced a more equitable rule of assessment, and fixed precisely the ratio to be laid upon each county; and his system was adhered to, with little variation, after the Restoration (Act of Convention, 23d January 1667). The rent fixed by these valuations, commonly called the valued rent, was that according to which the land-tax and most of the other public and parochial assessments were imposed till the passing of the recent Valuation Acts, 17 and 18 Vict. c. 91, 1854, and 20 and 21 Vict. c. 58, 1857. See VALUATION.

E'XTRACT OF MEAT is obtained by acting upon chopped meat by cold water, and gradually heating, when about one-eighth of the weight of the meat dissolves out, leaving an almost tasteless insoluble fibrine. The extract of meat contains the savoury constituents of the meat, and is a light nutritious article of food. See BEEF-TEA and BROTH. It may be concentrated into small bulk, and when desired, may be afterwards treated with water, and being heated, forms an agreeable, light, and nutritive soup.

EXTRA'CTION OF ROOTS. See EVOLUTION. The roots which have in practice to be most frequently extracted are the *square* and *cube* roots. It is proposed to explain the rule for their extraction as it is given in books of arithmetic. And first of the square root. The square of $a + b$ is $a^2 + 2ab + b^2$, and we may obtain the rule by observing how $a + b$ may be deduced from it. Arranging the expression according to powers of some letter a, we observe that the square root of the first term is a.

$$\begin{array}{rl} & a^2 + 2ab + b^2(a + b \\ & a^2 \\ \cline{2-2} 2a + b) & \quad 2ab + b^2 \\ & \quad 2ab + b^2 \\ \cline{2-2} \end{array}$$

Subtract its square from the expression, and the remainder is $2ab + b^2$. Divide $2ab$ by $2a$, and the result is b, the other term in the root. Multiply $2a + b$ by b, and subtract the product from the remainder. If the operation does not terminate, it shews that there is another term in the root. In this case, we may consider the two terms $a + b$ already found as one, and as corresponding to the term a in the preceding operation; and the square of this quantity having been by the preceding process subtracted from the given expression, we may divide the remainder by $2(a + b)$ for the next term in the root, and for a new subtrahend multiply $2(a + b)$ + the new term, by the new term; and the process may be repeated till there is no remainder. The rule for extracting the square root of a number is an adaptation of this algebraical rule. In fact, if the number be expressed in terms of the radix of its scale, it is seen to be a concealed algebraical expression of the order we have been considering. Thus, $N = ar^n + br^{n-1} + \ldots + q$. The number 576 in the denary scale may be written $5 \times 10^2 + 7 \times 10 + 6$; and treating it as an algebraical expression, we should find its root to be $2 \times 10 + 4$, or 24. The only part of the arithmetical rule now requiring explanation is the rule of pointing. As every number of one figure is less than 10, its square must be less than 10^2; generally, every number of n figures is less than 10^n (which is 1 followed by n ciphers); but also every number of n figures is not less than 10^{n-1}, and therefore its square is not less than 10^{2n-2}—which is the smallest number of $2n - 1$ figures. Also, 10^{2n} is the smallest number of $2n + 1$ figures. It follows that the square of a number of n figures has either $2n$ or $2n - 1$ figures. If, then, we put a point over the units place of a number of which the root is to be extracted, and point every second figure from right to left, the number of points will always equal that of the figures in the root. If the number of figures be even, the number will be divided into groups of two each; if odd, the last group will contain only a single figure.

The rule for the extraction of the cube root of a number is deduced from that for the extraction of the cube root of an algebraical expression in the same way as in the case of the square root. The cube of $(a + b)$ is

$$\begin{array}{rl} & a^3 + 3a^2b + 3ab^2 + b^3(a + b \\ & a^3 \\ \cline{2-2} 3a^2) & \quad 3a^2b + 3ab^2 + b^3 \\ & \quad 3a^2b + 3ab^2 + b^3 \end{array}$$

Hence the rule in algebra. Arrange the expression according to descending powers of a, the cube root of the first term a^3 is a, the first term of the root. Subtract its cube from the expression, and bring down the remainder. Divide the first term by $3a^2$, and the quotient is b, the second term of the root. Subtract the quantity $3a^2b + 3ab^2 + b^3$. If there is no remainder, the root is extracted. If there is, proceed as before, regarding $a + b$ as one term, corresponding to a in the first operation. Let, for example, $a + b = a^1$, then $3a^{1\;2}$ is the new trial divisor. If c be the new term or third figure of the root, then the quantity to be subtracted to get the next remainder is $3a^{1\;2}c + 3a^1c^2 + c^3$, and so on till there is no remainder. The rule of pointing in the extraction of the cube root may be proved, as in the case of the square root, by shewing that the cube of a number of n figures contains $3n$, $3n - 1$, or $3n - 2$ figures; and, therefore, if we put a point over the units place, and on each third figure, we shall have as many periods as there are figures in the root.

It may be observed that a rule for the extraction of any root of a number may be got from considering how, from the expansion of $a + b$ to the nth power, or $a^n + na^{n-1}b +$, &c., the root $a + b$ is to be obtained. See EVOLUTION and INVOLUTION.

EXTRA'CTIVE MATTER is the term applied to certain organic matters resembling humine, found in soils during the decay of vegetable matter, and which are precipitated during the concentration of water solutions.

E'XTRACTS, in a technical sense, are medicinal preparations of vegetable principles, got either by putting the plants in a solvent or menstruum, and then evaporating the liquid down to about the consistency of honey, or by expressing the juice of the plants and evaporating; this last is properly *inspissated juice.* Extracts, therefore, contain only those vegetable principles that are either held in solution in the juices of the plants themselves, or are soluble in the liquid employed in extracting them, and at the same time are not so volatile as to be lost during evaporation. Now, as many extractive matters are more or less volatile, it makes a great difference whether the operation is conducted at a low or at a high temperature. Extracts are called *watery* or *alcoholic* according as the menstruum employed is water or spirits. Ether is also used in extracting. Different plants of course afford different extracts, some being of the nature of bitters, others being used as pigments, tannin, &c. Extracts are liable to great uncertainty in point of strength and composition, and require to be prepared with great care. Evaporation in vacuo is found to be a great improvement.

EXTRADI'TION, the giving up, by authority of law, a person accused of a crime, to the foreign jurisdiction within which it was committed, in order that he may be tried there. Extradition is usually the subject of international treaty. A treaty or convention for this purpose was entered into between this country and France in 1843, and between this country and the United States of America the same year. Cases have frequently occurred where warrants have been granted, and their execution by the criminal officer aided by the authorities of countries with which we have no such convention. The authorities at Hamburg and Antwerp, and in Russia, have given English offenders over to the custody of the officer, or placed them on board a British vessel. On other occasions, they have convicted them, and punished them there, receiving a certified copy of the depositions as evidence of the crime committed in this country (Oke's *Magisterial Synopsis*, p. 724; and Oke's *Magisterial Formalist*, where the forms of warrants will be found for the guidance of justices).

EXTRAVASA'TION is the escape of any of the fluids of the living body from their proper vessels (*vas*) through a rupture or injury in their walls. Excrementitious matter thus sometimes escapes into the abdomen through a wound or ulceration of the bowels. But the term is oftenest used in speaking of the escape of blood from injured blood-vessels. Extravasation is distinguished from exudation by this, that in the last the vessels remain entire, and the effusion takes place by filtration through their walls; nor does more than a part of the blood so escape, the blood globules being retained, while in extravasation perfect blood is effused. Many kinds of extravasation are immediately fatal, such as that of urine or of gall into the abdomen, or of blood from the vessels of the brain in many cases of apoplexy. The dark colour resulting from a bruise is owing to extravasated blood from ruptured capillary vessels.

EXTREME UNCTION, a sacrament of the Roman Catholic Church, which, as the other sacraments supply spiritual aid in the various circumstances of life, is believed to impart to the Christian in death grace and strength to encounter the struggle, as well spiritual as bodily, of the dying hour. The rite of unction in different forms is common to several of the sacraments; the name 'extreme' is given to that of the present sacrament, because it is reserved for the last act of the Christian career. The council of Trent declares this sacrament, although 'promulgated' in the well-known passage of St James v. 14, 15 (which Protestants regard as having more to do with the general belief in the sanative properties of oil), to have been 'instituted' by Christ. The Fathers frequently allude to the rite of unction, and although many of these allusions certainly refer to the unctions of baptism and confirmation, yet Catholics rely on several passages of Origen, Chrysostom, Cæsarius of Arles, and Pope Innocent I., as decisive regarding the unction of the dying, as also upon the fact that in the various separated churches of Oriental Christians—Greek, Coptic, Armenian, and Nestorian—the rite is found, although with many ceremonial variations. In the Roman Catholic Church, the sacrament is administered by the priest, who, 'dipping his thumb in the holy oil, anoints the sick person, in the form of the cross, upon the eyes, ears, nose, mouth, hands, and feet; at each anointing making use of this form of prayer: "Through this holy unction, and his most tender mercy, may the Lord pardon thee whatever sins thou hast committed by thy sight. Amen." And so of the hearing and the rest, adapting the form to the several senses.'—Challoner's *Catholic Christian Instructed*. Extreme unction is reputed by Catholics one of the sacraments 'of the living;' that is, it ordinarily requires that the recipient should have previously obtained remission of his sins by absolution or by perfect contrition; but it is held to remit, *indirectly*, actual sins not previously remitted, and also (although not infallibly, but according to the merciful designs of Providence) to alleviate, and even to dispel, the pains of bodily disease. The holy oil which forms the 'matter' of this sacrament must be blessed by the bishop—a ceremony which is performed with great solemnity once each year by the bishop, attended by a number of priests, on Maundy-Thursday. The oil so blessed is reserved for use during the year. In the Greek Church, the sacrament is administered by several priests conjointly. In its most solemn form, seven priests unite in its administration; in ordinary circumstances, it is conferred by two. The Greek form of words also differs, although not substantially, from that of the Latin Church. The Greeks call this sacrament 'The Holy Oil,' and sometimes 'The Oil of Prayer.'

EXTREMITY. See SKELETON.

EXUMAS, comprising Great Exuma, Little Exuma, and the Exuma Keys, form part of the group of the Bahama Islands. They contain about 2000 inhabitants, who are employed partly in agriculture, including at one time the growing of cotton, but chiefly in salt-making. In the last-named business, the E. rank second among all the subdivisions of the group, having exported, in 1851, 115,356 bushels of salt. Next to Nassau in New Providence, Little Exuma is the most considerable port of entry in the Bahamas.

EXU'VIÆ, a term applied to organic remains, now seldom employed, but frequently used by the older geologists.

EYALET is, next to a province, the largest and most important of the divisions of the Turkish empire, which contains in all 36 eyalets. These are again divided into *livas* or *sanjaks*, the livas into *cazas* or districts, and the cazas into *nahiges* or communes, containing villages or hamlets. Each eyalet or general government, as it may be called, is administered by a pasha, who is governor, and the general name for whom is *vali* or viceroy. The governors of the eyalets belong to the Dignities of the Sword, and are pashas of two tails; and when they are raised to the rank of vizier, as is frequently the case, they become pashas of three tails.

EYCK, HUBERT and JAN VAN, two illustrious painters of the old Flemish school. Much discussion has arisen as to the time of the birth and death of these brothers, and the various dates assigned range from 1350 to 1400. Some maintain that Hubert was born in 1366, and Jan in 1370; while Kugler—in general a good authority on ancient art—states the dates to be 1366 and 1400, making Hubert 34 years older than Jan. Their birthplace was Maas-Eyck, and they chiefly resided at Bruges and Ghent, and became the founders of the Flemish school of painting. The honour of being the inventors of oil-painting is claimed for them, though sufficient evidence has been adduced to shew that it was practised previously. Before their time, the custom, however, particularly in Italy, was to paint with gums or other substances of an adhesive nature dissolved in water; and if not the inventors, they were at least the first who brought into notice and perfected the mode of mixing colours with oil or some medium of which oil was the chief ingredient; while, for transparent and brilliant colouring and minute finish, their works have never been surpassed. Till the death of Jan, the brothers generally painted in conjunction: one of their most important works was an altar-piece with folding-doors, representing the Elders adoring the Lamb—a subject taken from the Apocalypse—painted for *Jodocus Vyts*, who presented it to the cathedral of St Bavon, in Ghent. The two central divisions of this picture are all that now remain in the church at Ghent. Some of the wings are in the Gallery at Berlin. The masterpieces of the brothers are for the most part in the cities of Ghent, Bruges, Antwerp, Berlin, Munich, and Paris. In the National Gallery, London, there are three pictures of Jan van E., which, though small, well exemplify the high qualities of his works. These are portraits of a Flemish merchant and his wife, standing in the middle of an apartment, with their hands joined—signed and dated 1434: of the portrait of a man in a cloak and fur-collar, with a red handkerchief twisted round the head as a turban—painted, according to an inscription on the lower part of the frame, October 21, 1433: and portrait of a man with a dark-red dress, with a green head-covering—signed and dated 10th October 1432. Hubert died in 1426, and Jan in 1441. Compare Waagen, *Uber Hub. und Jan van Eyck* (Breslau, 1822).

EYE, Anatomy and Physiology of the. In this article we shall consider: 1. The structure of the human eyeball, and of certain accessory parts or appendages which serve to protect that organ, and are essential to the due performance of its functions. 2. The most striking modifications which this organ presents in some of the lower animals. 3. The special uses of the various parts of the eye considered as an optical instrument; and 4. The action of the retina.

1. The *globe of the eye* is placed in the anterior part of the cavity of the Orbit (q. v.), in which it is held in position by its connection with the optic nerve posteriorly, and with the muscles which surround it, and by the eyelids in front. It is further supported behind and on the sides by a quantity of loose fat, which fills up all the interstices of the orbit, and facilitates the various movements of which the eye is capable.

The form of the eyeball is nearly spherical; but on viewing the organ in profile, we see that it is composed of segments of two spheres of different diameters. Of these, the anterior, formed by the transparent cornea, has the smaller diameter, and is therefore the most prominent; and hence the antero-posterior slightly exceeds (by about a line) the transverse diameter. The radius of the posterior or sclerotic segment is about $\frac{19}{40}$ths, and that of the anterior segment about $\frac{13}{40}$ths of an inch.

When the eyes are in a state of repose, their antero-posterior axes are parallel; the optic nerves, on the other hand, diverge considerably from their commissure within the cavity of the skull to the point where they enter the globe; consequently, their direction does not coincide with that of the eye. Each nerve enters the back of the globe at a distance of about $\frac{1}{5}$th of an inch on the inner side of the antero-posterior axis of the eye.

The eyeball is composed of several investing membranes, and of certain transparent structures, which are enclosed within them, and which, together with the cornea (one of the membranes), act as refractive media of various densities upon the rays of light which enter the eye.

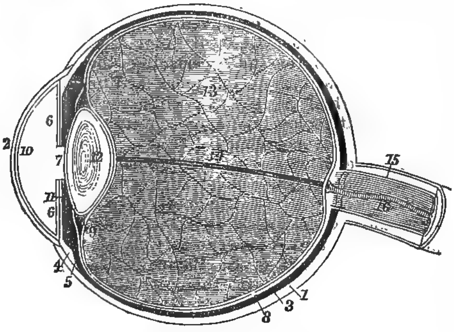


Fig. 1.

A longitudinal section of the coats of the eye.

1, the sclerotic, thicker behind than in front; 2, the cornea; 3, the choroid; 6, the iris; 7, the pupil; 8, the retina; 10, the anterior chamber of the eye; 11, the posterior chamber; 12, the crystalline lens, enclosed in its capsule; 13, the vitreous humour, enclosed in the hyaloid membrane, and in cells formed in its interior by that membrane; 15, the sheath; and 16, the interior of the optic nerve, in the centre of which is a small artery. (The other numbers in the figure refer to parts not noticed in this article.)

The outermost coat of the eye is the *sclerotic* (from *skleros*, hard). It is a strong, dense, white, fibrous structure, covering about four-fifths of the eyeball, and leaving a circular deficiency anteriorly, which is occupied by the cornea. Posteriorly, it is perforated by the optic nerve, and it is there continuous with the sheath which that nerve derives from the dura mater, the fibrous investment of the brain and spinal cord. Near the entrance of the nerve, its thickness is about $\frac{1}{20}$th of an inch; from this it diminishes to about $\frac{1}{40}$th; but in front it again becomes thicker, from the tendinous insertions of the straight muscles which blend with it. This coat, by its great strength and comparatively unyielding structure, maintains the enclosed parts in their proper form, and serves to protect them from external injuries.

The *cornea* (so called from its horny appearance) is a transparent structure, filling up the aperture left in the anterior part of the sclerotic. Its circumference is overlaid by the free edge of the sclerotic, which in some parts presents a groove, so as to retain it more firmly; and the connection by continuity of texture between the two structures is so close, that they cannot be separated in the dead body without considerable maceration.

The cornea, in consequence of its greater convexity, projects beyond the line of the sclerotic; the degree of convexity, however, varies in different persons, and at different periods of life. It is thicker than any part of the sclerotic, and so strong as to be able to resist a force capable of rupturing that tunic.

Although beautifully transparent, and appearing to be homogeneous, it is in reality composed of five layers, clearly distinguishable from one another—viz. (proceeding from the front backwards) 1. The conjunctival layer of epithelium. It is in this epithelium that particles of iron, stone, &c., forcibly driven against the eye, usually lodge, and it is a highly sensitive membrane. 2. The anterior elastic lamina forming the anterior boundary of the cornea proper; it is not more than $\frac{1}{2000}$th of an inch in thickness; and its function seems to be that of maintaining the exact curvature of the front of the cornea. 3. The cornea proper, on which the thickness and strength of the cornea mainly depend. 4. The posterior elastic lamina, which is an extremely thin membrane, in which no structure can be detected. It probably contributes, like the anterior lamina, to the exact maintenance of the curvature of the cornea, so necessary for correct vision. 5. The posterior epithelium of the aqueous humour, which is probably concerned in the secretion of that fluid.

For further details regarding these different layers, we must refer to Todd and Bowman's *Physiological Anatomy*, vol. ii. pp. 17—21.

The *choroid coat* is a dark-coloured vascular membrane, which is brought into view on the removal of the sclerotic. Its outer surface, which is nearly black, is loosely connected with the sclerotic by connective tissue, in which are contained certain nerves and vessels—termed the ciliary nerves and vessels—which go to the iris. Its inner surface is soft, villous, and dark-coloured. In front, it is attached to the membrane of the vitreous humour (see fig. 3) by means of the ciliary processes, which consist of about sixty or seventy radiating folds. These are alternately long and short, and each of them is terminated by a small free interior extremity; and they are lodged in corresponding folds in the membrane of the vitreous humour. In other parts, it is loosely connected with the retina. The choroid is composed of minute ramifications of vessels—especially of veins, which, from their whirl-like arrangement, are termed *vasa vorticosa*—of connective tissue, and of pigment cells, which usually approximate to the hexagonal form, and are about $\frac{1}{1000}$th of an inch in diameter. In albinos, this pigment is absent, and hence their eyes have a pink appearance, which is due to the unconcealed blood in the capillaries of the choroid and iris.

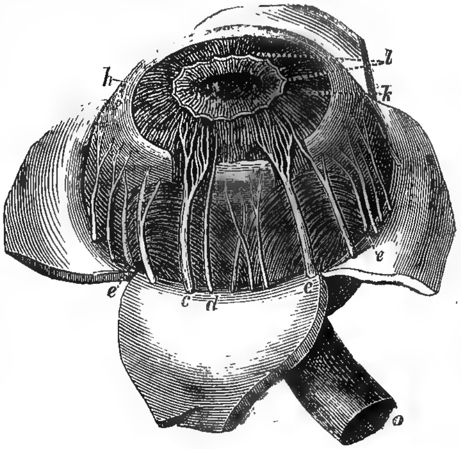


Fig. 2.

Choroid and iris, exposed by turning aside the sclerotic.

c, *c*, ciliary nerves going to be distributed in iris; *d*, *d*, smaller ciliary nerves; *e*, *e*, veins known as vasa vorticosa; *h*, ciliary ligament and muscle; *k*, *l*, converging fibres of iris; *o*, optic nerve.

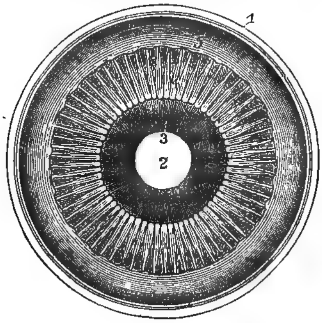


Fig. 3.

The iris and adjacent structures seen from behind.

1, the divided edge of the three coats, the choroid being the dark intermediate one; 2, the pupil; 3, the posterior surface of the iris; 4, the ciliary processes; 5, the scalloped anterior border of the retina.

The *iris* may be regarded as a process of the choroid, with which it is continuous, although there are differences of structure in the two membranes. It is a thin flat membranous curtain, hanging vertically in the aqueous humour in front of the lens, and perforated by the pupil for the transmission of light. It divides the space between the cornea and the lens into an anterior (the larger) and a posterior (the smaller) chamber, these two chambers freely communicating through the pupil (see fig. 1). The outer and larger border is attached all round to the line of junction of the sclerotic and cornea, while the inner edge forms the boundary of the pupil, which is nearly circular, lies a little to the inner side of the centre of the iris, and varies in size according to the action of the muscular fibres of the iris, so as to admit more or less light into the interior of the eyeball; its diameter varying, under these circumstances, from about $\frac{1}{3}$d to $\frac{1}{20}$th of an inch. It is muscular in its structure, one set of fibres being arranged circularly round the pupil, and, when necessary, effecting its contraction, while another set lie in a radiating direction from within outwards, and by their action dilate the pupil. These fibres are of the unstriped or involuntary variety. The nerves which are concerned in these movements will be presently noticed.

The varieties of colour in the eyes of different individuals, and of different kinds of animals, mainly depend upon the colour of the pigment which is deposited in cells in the substance of the iris.

Within the choroid is the *retina*, which, although continuous with the optic nerve—of which it is usually regarded as a cuplike expansion—differs very materially from it in structure. Before noticing the elaborate composition of this part of the eye, which has only been revealed by recent microscopical investigation, we shall briefly mention those points regarding it which can be established by ordinary examination. It is a delicate semi-transparent sheet of nervous matter, lying immediately behind the vitreous humour, and extending from the optic nerve nearly as far as the lens. On examining the concave inner surface of the retina at the back of the eye, we observe, directly in a line with the axis of the globe, a circular yellow spot (*limbus luteus*), of about $\frac{1}{20}$th of an inch in diameter, called, after its discoverer, the *yellow spot of Sömmering.* As there has been much discussion regarding the structure and function of this spot, we may observe that Dr Todd and Mr Bowman, two of our most eminent English microscopists, after several examinations, regard it as a small mound or projection of the retina towards the vitreous humour, with a minute aperture in the summit. The only mammals in which it exists are man and the monkey. Its use is unknown, but vision is remarkably perfect at this spot—a circumstance which, however, may possibly be accounted for by the fact, that it is singularly free from blood-vessels, which curve round it, and apparently avoid it.

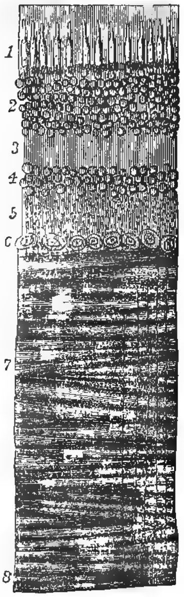


Fig. 4.

A vertical section of the human retina.

1, the layer of rods and cones (Jacob's membrane); 2, the external granular layer; 3, the intervening layer between 2 and 4, the internal granular layer; 5, finer granular layer; 6, layer of nerve-cells; 7, fibres of the optic nerve; 8, limitary membrane.

The structure of the retina, as revealed by the microscope, is in the highest degree remarkable. Although its greatest thickness (at the entrance of the optic nerve) is only about $\frac{1}{120}$th of an inch, and as it extends anteriorly, it soon diminishes to $\frac{1}{200}$th of an inch, the following layers from without inwards may be distinguished in all parts of it. (1.) The layer of rods and cones, frequently termed, from its discoverer, the *membrane of Jacob;* (2.) The granular layer, including the parts indicated by 2, 3, 4, 5, in the figure; (3.) The layer of gray nerve substance; (4.) The expansion of the optic nerve; and (5.) The limitary membrane. These various structures are shewn in fig. 4, which is copied from Kölliker and Müller's memoir on the structure of the retina. Details regarding the nature of these various layers are given in Kölliker's *Manual of Human Histology*, and in Todd and Bowman, *op. cit.*

It now remains for us to describe the *transparent media* which occupy the interior of the globe, and through which the rays of light must pass before they can reach the retina, and form on it the images of external objects. We shall consider them in the order in which the rays of light strike them.

Immediately behind the transparent cornea is the *aqueous humour* which fills up the anterior and posterior chambers which lie between the cornea and the lens. As its name implies, it is very nearly pure water, with a mere trace of albumen and chloride of sodium. As no epithelium exists in front of the iris, or on the anterior surface of the lens, it is most probably secreted by the cells on the posterior surface of the cornea.

The *crystalline lens* lies opposite to and behind the pupil, almost close to the iris, and its posterior surface is received into a corresponding depression on the forepart of the vitreous humour (see fig. 1). In form, it is a double-convex lens, with surfaces of unequal curvature, the posterior being the most convex. It is enclosed in a transparent capsule, of which the part covering the anterior surface is nearly four times thicker than that at the posterior aspect, in consequence, doubtless, of greater strength being required in front, where there is no support, than behind, where the lens is adherent to the vitreous membrane. The microscopic examination of the substance or body of the lens reveals a structure of wonderful beauty. Its whole mass is composed of extremely minute elongated ribbon-like structures, commonly called the *fibres of the lens*, which are regarded by Kölliker as *thin-walled tubes*, with clear, albuminous contents. These fibres are arranged side by side in lamellæ, of which many hundred exist in every lens, and which are so placed as to give to the anterior and posterior surfaces the appearance of a central star, with meridian lines.

The lens gradually increases in density, and, at the same time, in refracting power, towards the centre; by this means, the convergence of the central rays is increased, and they are brought to the same focus as the rays passing through the more circumferential portions of the lens. (According to Brewster, the refracting power at the surface is 1·3767, and at the centre 1·3990.)

According to Berzelius, the lens contains 58 per cent. of water, 36 of albumen, with minute quantities of salts, membrane, &c. In consequence of the albumen, it becomes hard and opaque on boiling, as we familiarly see in the case of the eyes of boiled fish. In the adult, its long diameter ranges from $\frac{1}{3}$d to $\frac{3}{8}$ths, and its antero-posterior diameter from $\frac{1}{5}$th to $\frac{1}{6}$th of an inch; and it weighs three or four grains.

The *vitreous humour* lies in the concavity of the retina, and occupies about four-fifths of the eye posteriorly. Its form is shewn in fig. 1. It is enclosed in the hyaloid membrane, which sends numerous processes inwards, so as to divide the cavity into a series of compartments, and thus to equalise the pressure exerted by the enclosed soft gelatinous mass. Between the anterior border of the retina and the border of the lens, we have a series of radiating folds or plaitings termed the *ciliary processes of the vitreous body*, into which the *ciliary processes of the choroid* dove-tail. The vitreous humour contains, according to Berzelius, 98·4 per cent. of water, with a trace of albumen and salts, and hence, as might be expected, its refractive index is almost identical with that of water.

The appendages of the eye now claim our notice. The most important of these appendages are the *muscles within the orbit*, the *eyelids*, the *lachrymal apparatus*, and the *conjunctiva*, to which (although less important) we may add the *eyebrows*.

The *muscles* by which the eye is moved are four straight (or *recti*) muscles, and two oblique (the superior and inferior). The former arise from the margin of the optic foramen at the apex of the orbit, and are inserted into the sclerotic near the cornea, above, below, and on either side. The superior oblique arises with the straight muscles; but after running to the upper edge of the orbit, has its direction changed by a pulley, and proceeds backwards, outwards, and downwards (see fig. 5). The inferior oblique arises from the lower part of the orbit, and passes backwards, outwards, and upwards. The action of the straight muscles is sufficiently obvious from their direction: when acting collectively, they fix and retract the eye; and when acting singly, they turn it towards their respective sides. The oblique muscles antagonise the recti, and draw the eye forwards; the superior, acting above, directs the front of the eye downwards and outwards, and the inferior upwards and inwards. By the duly associated action of these muscles, the eye is enabled to move (within definite limits) in every direction.

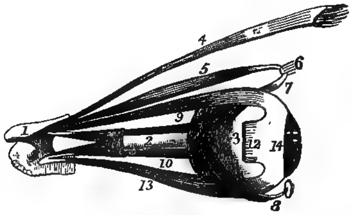


Fig. 5.

The muscles of the eyeball, the view being taken from the outer side of the right orbit.

1, a small fragment of the sphenoid bone at the back of the orbit, containing the foramen, through which, 2, the optic nerve passes; 3, the globe of the eye; 4, the levator palpebræ muscle; 5, the superior oblique muscle; 6, its cartilaginous pulley, attached to the upper edge of the orbit; 7, its reflected tendon; 8, the inferior oblique muscle, the little knob near the figure 8 being a detached fragment of the superior maxillary bone, from which it arises; 9, the superior rectus; 10, the internal rectus, partly concealed by the optic nerve; 11, 12, the two ends of the external rectus, the intermediate portion having been removed; 13, the inferior rectus; 14, the tunica albuginea, formed by the expansion of the tendons of the four recti muscles.

The *eyelids* are two thin movable folds placed in front of the eye, to shield it from too strong light, and to protect its anterior surface. They are composed of (1) skin; (2) of a thin plate of fibro-cartilage, termed the tarsal cartilage, the inner surface of which is grooved by thirty or forty parallel vertical lines, in which the Meibomian glands are imbedded; and (3) of a layer of mucous membrane, continuous, as we shall presently see, with that which lines the nostrils, and which joins the skin at the margin of the lids, in which the eyelashes (*cilia*) are arranged in two or more rows. The upper lid is much the larger; and to the posterior border of its cartilage, a special muscle is attached, termed the *levator palpebræ superioris*, whose object is to elevate the lid, and thus open the eye; while there is another muscle, the *orbicularis palpebrarum*, which surrounds the orbit and eyelids, and by its contraction closes the eye. The Meibomian glands secrete a sebaceous matter, which facilitates the free motion of the lids, and prevents their adhesion. The eyelashes intercept the entrance of foreign particles directed against the eye, and assist in shading that organ from an excess of light.

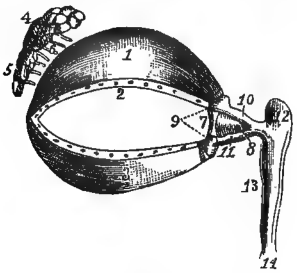


Fig. 6.

The appendages of the eye.

1, the cartilage of the upper eyelid; 2, its lower border, shewing the openings of the Meibomian glands; 3, the cartilage of the lower eyelid, also shewing on its border the openings of the Meibomian glands; 4, 5, the lachrymal gland; 6, its ducts; 7, the plica semilunaris; 8, the caruncula lachrymalis; 9, the puncta lachrymalia, opening into the lachrymal canals; 10, 11, the superior and inferior lachrymal canals; 12, the lachrymal sac; 13, the nasal duct, terminating at 14 in the lower meatus of the nose.

The *lachrymal apparatus* consists of the lachrymal gland, by which the tears are secreted; two canals, into which the tears are received near the inner angle of the eye; the sac, into which these canals open; and the duct, through which the tears pass from the sac into the nose. The gland is an oblong body, about the size of a small almond, lying in a depression in the upper and outer part of the orbit. The fluid secreted by it reaches the surface of the eye by seven or eight ducts, which open on the conjunctiva at its upper and outer part. The constant motion of the upper eyelid induces a continuous gentle current of tears over the surface, which carry away any foreign particle that may have been deposited on it. The fluid then passes through two small openings, termed the *puncta lacrymalia* (see 9 in fig. 6), into the canals; whence its further course into the lower portion of the nose is sufficiently obvious from the figure. The conjunctiva (or mucous coat) which covers the front of the eyeball, and lines the inner surface of the lids, passes down and lines the canals, sac, and duct; and is thus seen to be continuous with the nasal mucous membrane, of which it may be regarded as an offshoot or digital prolongation. See MUCOUS MEMBRANE.

We shall conclude this sketch of the anatomy of the human eye by a brief notice of the *nerves* going to this organ and its appendages.

Into each orbit there enters a nerve of *special sense*—viz., the optic nerve, a nerve of *ordinary sensation*—viz., the ophthalmic branch of the fifth nerve, and certain nerves of *motion* going to the muscular tissues, and regulating the movements of the various parts—viz., the third, fourth, and sixth nerves.

As the optic tracts from which the *optic nerves* originate are noticed in the article BRAIN, we shall merely trace these nerves from their *chiasma* or commissure forwards. This commissure results from the junction of the optic tracts of the two sides; and it is especially remarkable for the fact, that it presents a partial decussation of the nervous fibres; the central fibres of each tract passing into the nerve of the *opposite* side, and crossing the corresponding fibres of the other tract, while the outermost fibres, which are much fewer in number than the central ones, pass to the optic nerve of the *same* side. In front of the commissure, the nerves enter the optic foramen at the apex of the orbit, receive a sheath or investment from the *dura mater*, acquire increased firmness, and finally terminate in the retina.

The peculiar mode of termination of the optic nerves in the cuplike expansion of the retina, the impairment or loss of vision which follows any morbid affection of them, and the constant relation in size which is observed in comparative anatomy between them and the organs of vision, afford sufficient evidence that they are the proper conductors of visual impressions to the sensorium.

The first or ophthalmic division of the fifth or trifacial nerve sends branches to the skin of the eyelids and to the conjunctiva. That it is the nerve of ordinary sensation of the eye, is sufficiently obvious from the following facts: (1) That in disease of this nerve in the human subject, it is not uncommon to find the eyeball totally insensible to every kind of stimulus (particles of dust, pungent vapours, &c.); and (2) that if the nerve be divided in the cranium (in one of the lower animals), similar insensibility results.

The most important of the nerves of motion of the eye is the third nerve, or *motor oculi*. It supplies with motor power the elevator of the upper eyelid, and all the muscles of the globe, except the superior oblique and the external straight muscle, and, in addition to this, it sends filaments to the iris and other muscular fibres within the eye. The application of an irritant (in vivisection experiments) to its trunk induces convulsive contraction of the principal muscles of the ball and of the iris; while division of the trunk occasions an external squint, with palsy of the upper eyelid and fixed dilatation of the pupil. The squint is caused by the action of the external straight and the superior oblique muscles, while the other muscles are paralysed by the operation. The normal motor action of the nerve upon the iris, in causing contraction of the pupil, is excited through the optic nerve, and affords a good illustration of *Reflex Action* (q. v.); the stimulus of light falling upon the retina, and, through it, exciting that portion of the brain from which the third nerve takes its origin. This nerve clearly exerts a double influence in relation to vision: (1) it mainly controls the movements of the eyeball and the upper eyelid; and (2) from its connection with the muscular structures in the interior, it regulates the amount of light that can enter the pupil, and probably takes part in the adjusting power of the eye to various distances.

The fourth nerve supplies the superior oblique muscle with motor power, while the sixth nerve similarly regulates the movements of the external straight muscle—the only two muscles in the orbit which are not supplied by the third pair.

Although not entitled to be termed a nerve of the orbit, the facial nerve deserves mention as sending a motor branch to the *orbicularis* muscle, by which the eye is closed.

2. *Comparative Anatomy of the Eye.*—In *mammals*, the structure of the eye is usually almost identical with that of man. The organ is, however, occasionally modified, so as to meet the peculiar wants of the animal. Thus, in the Cetacea, and in the amphibious Carnivora that catch their prey in the water, the shape of the lens is nearly spherical, as in fishes, and there is a similar thickening of the posterior part of the sclerotic, so as to thrust the retina sufficiently forward to receive the image formed by such a lens. (See the subsequent remarks on the eyes of fishes.) Again, instead of the dark-brown or black pigment which lines the human choroid, a pigment

of a brilliant metallic lustre is secreted in many of the carnivora, forming the so-called *tapetum lucidum* at the bottom of the eyeball, which seems (according to Bowman) to act as a concave reflector, causing the rays of light to traverse the retina a second time, and thus probably increasing the visual power, particularly where only a feeble light is admitted to the eye. The pupil, moreover, varies in form, being transversely oblong in the Ruminants and many other Herbivora, and vertically oblong in the smaller genera of Cats. These shapes are apparently connected with the positions in which the different animals look for their food. Lastly, in some mammals (for example, the horse), there is a rudimentary third eyelid, corresponding to the *membrana nictitans* of birds.

In *birds*, the eye, though presenting the same general composition as in man, differs from the mammalian eye in several important points. From our knowledge of the habits of birds (especially birds of prey), we should naturally expect that from their rapid movements they should be able readily to alter the focus between the extremes of long and short sighted vision, and the modifications we shall now proceed to notice clearly have this object in view.

In reference to the figure, which represents a section of the eye of the owl, we see (1) that the shape of the organ is not spherical, as in mammals, nor flattened anteriorly, as in fishes and aquatic reptiles, but that the cornea is very prominent, and the antero-posterior diameter lengthened; the consequence of this arrangement being to allow room for a large quantity of aqueous humour, and to increase the distance between the lens and the posterior part of the retina, and thus to produce a greater convergence of the rays of light, by which the animal is enabled to discern near objects, and to see with a faint light. In order to retain this elongated form, we find a series of bony plates, forming a broad zone, extending backwards from the margin of the cornea, and lying embedded in the sclerotic. The edges of the pieces forming this bony zone overlap each other, and are slightly movable, and hence, when they are compressed by the action of the muscles of the ball, there is protrusion of the aqueous humour and of the cornea, adapting the eye for near vision; while relaxation of the muscles induces a corresponding recession of the humour and flattening of the cornea, and fits the eye for distant vision. The focal distance is further regulated by a highly vascular organ called the *marsupium*, or *pecten*, which is lodged in the posterior part of the vitreous humour (fig. 7, *a*). It is attached to the optic nerve at the point where it expands into the retina, and seems to be endowed with a power of dilatation and contraction; as it enlarges, from distension of its blood-vessels, it causes the vitreous humour to push the lens forwards, while, as it collapses, the lens falls backwards again towards the retina.

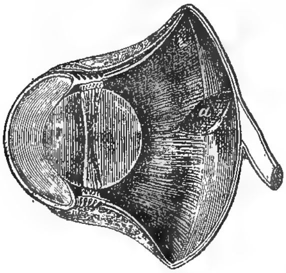


Fig. 7.—Eye of Bird.

In addition to an upper and lower eyelid, birds have an elastic fold of conjunctiva, which, in a state of repose, lies in the inner angle of the eye, but is movable by two distinct muscles, which draw it over the cornea. It is termed the *membrana nictitans;* it is to a certain degree transparent, for (according to Cuvier) birds sometimes look through it, as, for example, the eagle when looking at the sun. The lachrymal gland is situated as in mammals, but there is here a second gland, the *glandula Harderi,* which yields a lubricating secretion.

There are no very special peculiarities in the eyes of *reptiles,* and we therefore proceed to notice the most remarkable points presented by the eye in *fishes.* From the comparatively great density of the medium (water) through which the rays of light pass before they impinge upon the transparent structure of the eye of the fish, it is obvious that this organ must act as a very powerful refractive apparatus. The main peculiarity in the eye of the fish is the size, extreme density, and spherical shape of the lens, which give it such an extraordinary magnifying power that it has been employed as a simple microscope. See Brewster's *Treatise on the Microscope,* p. 31. But its focus being shortened in proportion as its power is increased, it is necessary that the retina should be brought near its posterior surface. For this purpose, the eyeball is flattened by diminishing the quantity of vitreous humour, which, being of nearly the same density as the external water, exerts no perceptible power in bringing the rays of light towards a focus; and this flattened form is maintained by the existence of two cartilaginous plates in the tissue of the sclerotic, which in some of the larger fishes is actually converted into a bony cup. The aqueous humour having here no refractive power, is barely sufficient to allow the free suspension of the iris. The pupil is very large, so as to take in as much light as possible, but is generally motionless. Their eyes being constantly washed by the water in which they live, no lachrymal apparatus is necessary, nor does any exist; and the same remark applies to the *cetacea* amongst the mammals. We thus see that throughout the sub-kingdom of the *vertebrata* the eye is constructed according to one general scheme, with modifications to suit the mode of life of individual classes.

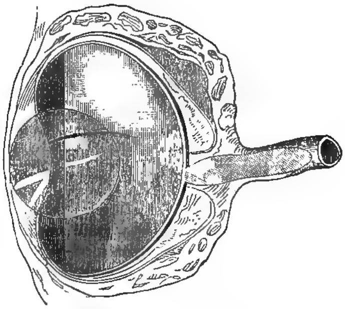


Fig. 8.—Eye of Fish.

In all the above cases, the structure of the eye is essentially the same; that is to say, we have certain dioptric media for collecting the divergent rays to their proper focus on the retina, and we have the means of adjusting the eye for different distances. But if we examine the eyes of insects, we find that they are constructed on different principles.

In these animals, we have *simple* and *compound* eyes usually associated in the same individual. The simple eyes resemble in many respects the corresponding organs in higher animals, but the compound eyes are extremely elaborate and complex in their structure. They are two in number, appearing as hemispherical masses on the sides of the head. When examined with the microscope, their surface is seen to be divided into an enormous number of hexagonal facets, which are in fact corneæ. In the ant, there are only 50 of these facets in each eye; in the common house-fly, 4000; in butterflies, upwards of 17,000; and in some of the beetles more than 25,000. Each cornea is found to belong to a distinct eye, provided with a nervous apparatus, and exhibiting a lens, iris, and pupil. Strauss Durckheim, who has carefully studied these structures in the cockchafer, suggests that, the eyes of insects being fixed, nature has made up for their want of mobility by their number, and by turning them in all directions; so that it might be said that these little animals have a distinct eye for every object.

Compound eyes of similar structure occur in many of the crustaceans.

3. Having now described the anatomical structure of the eye in man and certain of the lower animals, we are able to proceed to the consideration of the uses of the various parts of this organ. Assuming a general knowledge of the ordinary laws of geometrical optics (see DIOPTRICS, LENS, &c.), we will trace the course of the rays of light proceeding from any luminous body through the different media on which they impinge. If a luminous object, as, for example, a lighted candle, be placed at about the ordinary distance of distinct vision (about ten inches) from the front of the eye, some rays fall on the sclerotic, and being reflected, take no part in vision; the more central ones fall upon the cornea, and of these some also are reflected, giving to the surface of the eye its beautiful glistening appearance; while others pass through it, are converged by it, and enter the aqueous humour, which probably exerts no perceptible effect on their direction. Those which fall on and pass through the outer or circumferential part of the cornea are stopped by the iris, and are either reflected or absorbed by it; while those which fall upon its more central part pass through the pupil, and are concerned in vision. In consequence of its refractive power, the rays passing through a comparatively large surface of the cornea are converged so as to pass through the relatively small pupil and impinge upon the lens, which, by the convexity of its surface, and by its greater density towards the centre, very much increases the convergence of the rays passing through it. They then traverse the vitreous humour, whose principal use appears to be to afford support to the expanded retina, and are brought to a focus upon that tunic, forming there an exact but inverted image of the object.

This inversion of the image may be easily exhibited in the eye of a white rabbit or other albino animal, after removing the muscles, &c., from the back part of the globe. The flame of a candle held before the cornea may be seen inverted at the back of the eye, increasing in size as the candle is brought near, diminishing as it retires, and always moving in a direction opposite to that of the flame.

The adaptation of the eye to distinct vision at every distance beyond that of a few inches, is extremely remarkable, and numerous attempts have been made to explain the mechanism by which its focal length admits of alteration under the influence of the will. One view that has met with much support is, that the focal length is modified by a slight movement of the lens. In the eye of the bird there is a structure termed the *ciliary muscle*, which obviously approximates the lens to the cornea when a short field of view is required, and although the corresponding structure is only slightly developed in man and mammals, it is probably sufficiently strong to produce the slight action required; while for the vision of distant objects the lens is carried back towards the retina by the elasticity of the connecting tissues. It would appear, however, from the recent researches of Cramer, Helmholtz, Allen Thomson, and others, that the accommodation is effected rather by a change in the *form* than in the *position* of the lens. It has been experimentally proved, that when the eye is turned from a distant to a near object, the antero-posterior diameter of the lens becomes elongated, and the anterior surface becomes more convex, while the opposite changes take place in turning the eye from a near to a distant object. According to Helmholtz, the radius of curvature of the anterior surface of the lens diminishes on turning the eye to a near object from ten to six millimetres (from about 0·4 to 0·24 of an inch), while the most projecting point of the same surface is brought forward about 0·2 of an inch.

Whichever view be adopted, the ciliary muscle takes an active part in the process. According to the observations of Hueck, the focal distance may be changed about three times in a second. The accommodation from a near to a distant object is effected much more rapidly than the converse process.

There are two well-known forms of defective vision in which this power of adaptation is very much limited—viz., short-sightedness or *myopia*, and long-sightedness or *presbyopia*. The limitation, however, is not due to a defect in the muscular apparatus to which we have referred, but to an abnormality either in the curves or in the density of the refracting media. In *short-sightedness* from too great a refractive power from either cause, the rays from objects at the ordinary range of distinct vision are brought too soon to a focus, so as to cross one another, and begin to diverge before they fall on the retina; the eye in this case being able to bring to the proper focus on the retina only those rays which were previously diverging at a large angle from a very near object. The correction for this deficiency is accomplished by interposing between the eye and indistinctly-seen objects a *concave* lens, with a curvature just sufficient to throw the images of external objects at the ordinary distance of distinct vision backwards upon the retina. In *long-sightedness*, on the other hand, there is an abnormal diminution of the refractive power from too flat a cornea, a deficient aqueous humour, or a flattening of the lens, so that the focus is behind the retina. This defect is corrected by *convex* lenses, which increase the convergence of the rays of light. Long-sightedness, as its name *presbyopia* indicates, usually comes on at a comparatively advanced period of life, while short-sightedness is most commonly met with in young persons; but both these rules present occasional exceptions; and the common belief that the latter affection naturally disappears after the middle period of life, is altogether erroneous.

We have already noticed the most essential use of the iris—viz., its power, under the influence of light upon the retina, of modifying the size of the pupil, so as to regulate the amount of light entering the eye. But this is not its only use; one of its offices being to prevent the passage of rays through the circumferential part of the lens, and thus to obviate the indistinctness of vision which would arise from *spherical aberration* (the unequal refraction of the rays passing through the centre and near the margin of the lens), in the same manner as the diaphragms employed by the optician. But there are additionally two other means by which this spherical aberration is prevented, which so well illustrate the wondrous mechanism of the eye, that we cannot omit to notice them. They are described by Professor Wharton Jones as follows:

(1.) 'The surfaces of the dioptric parts of the eye are not spherical, but those of the cornea and posterior surface of the lens are hyperbolical, and that of the anterior surface of the lens elliptical—configurations found by theory fitted to prevent spherical aberration. This discovery was made at a time when it was not known but that the dioptric parts of the eye had spherical surfaces.

(2.) 'The density of the lens diminishing [as we have already shewn] from the centre to its periphery, the circumferential rays are less refracted than they would have been by a homogeneous lens with similar surfaces. This elegantly simple contrivance has been hitherto inimitable by human art.'—*The Actonian Prize Treatise*, 1851, p. 50.

Chromatic aberration, which is caused by the unequal refrangibility of the primitive rays of which white light is composed, when transmitted through an ordinary lens, whereby coloured fringes are produced, is *practically* corrected in the eye, although it is doubtful whether it is *entirely* absent. The provision, however, on which the achromatism depends has not been determined with certainty, probably because we do not yet know the relative refractive and dispersive powers of the cornea and humours of the eye. Sir David Brewster denies that the chromatic aberration receives any correction in the eye, and maintains that it is imperceptible only in consequence of its being extremely slight.

4. We have hitherto been considering the eye as an optical instrument which projects pictures of external objects on the retina; we now come to the action of the nervous tunic, the *retina*, and its adaptation to the physical construction of the eye.

When the retina or the optic nerve is stimulated, we have the sensation of light, whatever may be the nature of the stimulus employed—as, for example, if it be a blow on the eye in the dark, or irritation of the optic nerve from some morbid condition. The sensation of light, then, consists in a recognition by the mind of a certain condition of these nervous structures, and this condition may be induced by the application of any stimulus; the ordinary stimulus obviously being the rays of light which fall upon the retina. There must, however, be a certain amount of light for the purpose of vision. Every one knows that it is difficult and painful to discern objects in a very faint light; and, on the other hand, that on suddenly entering a brilliantly lighted room from the dark, everything appears confused for one or two seconds. There is, however, a gradual adaptation of the retina to different amounts of light. Persons long immured in dark dungeons acquire the power of distinctly seeing surrounding objects; while those who suddenly encounter a strong light, are unable to see distinctly until the shock which the retina has experienced has subsided, and the iris has duly contracted. In protecting the retina from the sudden effects of too strong a light, the iris is assisted by the eyelids, the orbicular muscle, and, to a certain extent, by the eyebrows. Moreover, the dark pigment of the choroid coat acts as a permanent guard to the retina, and where it is deficient, as in albinos, an ordinary light becomes painful, and the protective appendages, especially the eyelids, are in constant use.

The persistence, during a certain time, of impressions made on the retina, facilitates the exercise of sight. A momentary impression of moderate intensity continues for a fraction of a second; but if the impression be made for a considerable time, it endures for a longer period after the removal of the object. Thus, a burning stick, moved rapidly in a circle before the eyes, gives the appearance of a continuous ribbon of light, because the impression made by it at any one point of its course remains on the retina until it again reaches that point. It is owing to this property that the rapid and involuntary act of winking does not interfere with the continuous vision of surrounding objects; and, to give another illustration of its use, if we did not possess it, the act of reading would be a far more difficult performance than it now is, for we should require to keep the eye fixed on each word for a longer period, otherwise the mind would fail fully to perceive it. Again, in consequence of the retention of sensations by the retina, the image of an object may continue to be seen, especially in certain morbid states of the system, and in twilight, for some seconds after the eyes have been turned away from it, and this physiological phenomenon has probably given origin to many stories of ghosts and visions. Thus, if a person has unconsciously fixed his eyes, especially in the dusk, on a dark post or stump of a tree, he may, on looking towards the gray sky, see projected there a gigantic white image of the object, which may readily be mistaken for a supernatural appearance. These ocular spectra are always of the complementary colour to that of the object. Thus, the spectrum left by a red spot is green; by a violet spot, yellow; and by a blue spot, orange. However great may be the velocity of a luminous body, it can always be seen; but if an opaque body move with such rapidity as to pass through a space equal to its own diameter in a less time than that of the duration of the retinal impression, it is altogether invisible; and hence it is, for example, that we cannot see bullets, &c., in the rapid part of their flight.

A small portion of the retina, corresponding to the entrance of the optic nerve, is incapable of exciting the sensation of vision when it receives the image of an object. According to Volkmann, this small invisible spot exactly corresponds in size with the artery lying in the centre of the optic nerve. If the 'blind spot' had been situated in the axis of the eye, a blank space would always have existed in the centre of the field of vision, since the axes of the eyes in vision correspond. But as it is, the blind spots do not correspond when the eyes are directed to the same object; and hence the blank which one eye would present is filled up by the other eye. Mariotte, early in the last century, first described the existence of these blind spots. Any one may satisfy himself of their existence by the following simple experiment. Let two small black circles be made upon a piece of paper, about four or five inches apart, then let the left eye be closed, and the right eye be strongly fixed upon the left-hand circle. If the paper be then moved backwards and forwards, a point will be found at which the right-hand circle is no longer visible, although it reappears when the paper is either brought nearer or removed further. Although no other part of the retina possesses the complete insensibility presented by the blind spot, it is probable that its anterior portions have very little to do with vision. When using only one eye, we direct it towards the object we wish to inspect, in such a way as to throw the image to the back of the globe; and when the eye is thus fixed, objects near the boundary of the field of vision are less distinctly seen than those at its centre.

The extent of the field of vision for a single eye, the head being fixed, has been calculated by Dr Young. He found that the eyeball was capable of a movement of 55 degrees in every direction, so that a single eye may have perfect vision of any point within a range of 110 degrees.

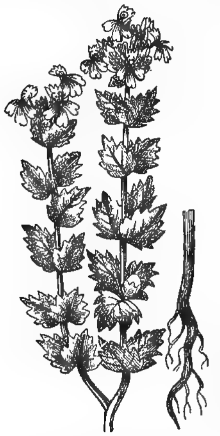
We have not yet referred to the longitudinal range, or greatest distance of human vision; indeed, this range varies so extremely that it is difficult to assign an arbitrary limit to it. Many uncivilised races, as the North American Indians, and the inhabitants of the vast Asiatic steppes, possess powers of sight which would appear almost incredible if they had not been thoroughly and frequently corroborated. Our information is more definite regarding the limits of human vision in regard to the minuteness of the objects of which it can take cognizance. Ehrenberg has carefully studied this subject, and has arrived at the following results. The side of the smallest square magnitude usually visible to the naked eye—either of white particles on a black ground or conversely—is about $\frac{1}{405}$th of an inch; and with the greatest condensation of light and effort on the part of the observer, squares with a side as small as $\frac{1}{540}$th of an inch *may* be recognised, but without sharpness or certainty. Bodies smaller than these, when observed singly, cannot be discerned by the *naked* eye, but may be seen when placed in a row. Much smaller particles may, however, be distinctly seen, if they powerfully reflect light; thus, gold-dust, which in none of its diameters exceeded $\frac{1}{1125}$th of an inch, is easily discernible in common daylight. The delicacy of vision is far greater for lines than for minute areas, since opaque threads of $\frac{1}{4000}$th of an inch may be discerned when held towards the light.

Various topics which the reader might perhaps have expected to find noticed, such, for instance, as 'single vision with two eyes,' 'the appreciation of solid forms by the sense of vision,' 'correct vision with an inverted image on the retina,' &c., which belong fully as much to metaphysics as to physiology, will be discussed in a future article on Vision. In the meantime, we may refer those who desire information on these points to Professor Bain's treatise on *The Senses and the Intellect.*

EYE, Diseases of the. The diseases of the eye enumerated by the surgeon are very numerous, partly from the variety of the tissues and parts of which it is formed, partly because the exposed situation and transparency of the eye enable the diseases to be seen. Nearly all its parts are liable to inflammation and its consequences. See Ophthalmia. The eyelids are liable to various diseases, as growths of several kinds, most of which the surgeon may remove; inflammation, as blear-eye (ophthalmia tarsi); to be misdirected inwards or outwards, *Entropium* and *Ectropion* (q. v.); and the upper eyelid may fall down (ptosis) from palsy of the common motor oculi nerve. The eyelashes may grow in upon the eye (trichiasis), and produce serious results. When plucked out, they grow again; and if they still grow in upon the eye after this palliative treatment has been tried several times, the surgeon has to cut down on their roots, and destroy them. The duct which conveys away the tears to the nose is liable to inflammation and obstruction, causing watery eye. See Lachrymal Organs, Diseases of. The cornea is liable to opacity in various degrees. The mere *nebula* or cloudy condition, either limited or general, may pass off, and leave the cornea again clear; but the white mark, which is the cicatrix or scar of an ulcer, is permanent, although it may become smaller by the disappearance of the surrounding haze. The pupil may be closed as the result of iritis, or of operations for cataract, and an artificial pupil may be made by either of the three methods—incision, excision, or separation—but the operation is seldom attended with success. For opacities of the crystalline lens, see Cataract. For an account of diseases of the nervous parts of the eye, see Amaurosis. Various affections of vision may arise from peculiar or altered conditions of the refracting humours of the eye—as near-sightedness (myopia), far-sightedness (presbyopia), the appearance of bodies (muscæ) floating in or before the eye; and there may be double vision (diplopia), with two eyes or with one. See Vision, Abnormal Conditions of. The parts between the eye and its bony orbit may be the seat of inflammation, abscess, or tumour, making the eye protrude. The movements of the eyeballs may be affected from palsy of the motor nerves, or from contraction of the lateral recti muscles, causing inward or outward squinting. See Strabismus. The eye may lose all feeling, from palsy of the fifth pair of nerves. The whole of the same side of the face, nostril, and mouth, will be in the same condition, and the eye becomes inflamed and disorganised. Substances thrown against the eye may injure it. Quicklime is rapidly destructive to the eye, slaked lime and mortar less so. When one of these, or any other caustic, has got into the eye, sweet oil is the best thing to introduce, until the surgeon arrives to remove them. If it is oil of vitriol (sulphuric acid) that has been the cause of the injury, a weak solution of soda may be used in the first place to neutralise the acid. In gunpowder explosions near the eye, besides the burn, the particles are driven into the surface of it, and will cause permanent black stains over the white of the eye, unless they are carefully removed at the time. When chips of glass, stone, &c., are driven into the interior of the eye, there is little hope of it being saved from destructive inflammation. When only partially sunk into the cornea, as is often the case with sparks of hot iron, or 'fires,' as they are called, the rubbing of the projecting part on the eyelid causes great pain, and the surgeon has not much difficulty in removing them. Most commonly these, or other 'foreign bodies,' as particles of dust, sand, seeds, flies, &c., merely get into the space between the eyeball and the lids, almost always concealed under the upper, as it is the larger, and sweeps the eye. They cause great pain, from the firmness and sensitiveness of the papillary surface of the lid, soon excite inflammation, and their presence, as the cause, is apt to be overlooked. The lid must be turned round to find them. To do this, pull the front or edge of the lid forwards by the eyelashes, held with the finger and thumb, and at the same time press down the back part of the lid with a small pencil or key. The lid will readily turn round, when the body may be seen about its middle, and may be removed with the corner of a handkerchief. Another plan, which the person himself may try, is to pull forward the upper lid by the eyelashes, and push the lashes of the lower lid up behind it, when the foreign body may be brushed out. After the bodies are removed, a feeling as if they were still there may remain for some time.

EYE, a parliamentary and municipal borough in the north of Suffolk, near the source of the Waveney, 20 miles north of Ipswich. Its streets are rather narrow and irregular. Pop. (1861) 2430. It sends one member to parliament, the parliamentary borough including eleven parishes. Eye, in Anglo-Saxon, means island; the river surrounding the town. There was formerly a castle and priory here.

EYEBRIGHT (*Euphrasia*), a genus of plants of the natural order *Scrophulariaceæ*, having a tubular calyx, the upper lip of the corolla divided, the lower of three nearly equal lobes, the cells of the anthers spurred at the base, a two-celled capsule and striated seeds. Some of the species are root-parasites. The only British species is the Common E. (*E. officinalis*), a little plant of at most six or eight inches in height, with ovate serrated leaves, and white or reddish flowers streaked with purple, appearing singly in the axils of the leaves. It is very abundant in many pastures, and even on high mountains, where—as in very northern regions—it is often to be seen of only an inch in height, gemming the ground abundantly with its bright little flowers. It is a very widely distributed plant, a native of most parts of Europe, the north of Asia, the Himalaya, &c. It was once in great repute as a cure for ophthalmia, and is still much used in rustic practice for diseases of the eye. A spot on the corolla, something like a pupil, gave it much of its reputation, whilst the fanciful doctrine of *signatures* prevailed in medicine; but it has been found really efficacious in catarrhal inflammations of the eye, and in other catarrhal affections. It is a weak astringent. It is the *Euphrasy* of Milton, with which he represents the archangel Michael as *purging the visual nerve* of Adam.



Common Eyebright (*Euphrasia officinalis*).

EYE-PIECE, the name given to the microscope by means of which the image of the object formed in the focus of a telescope is observed. See TELESCOPE.

EYLAU, usually called Prussian Eylau, a town in the government of Konigsberg, and 22 miles south of the town of that name, contains about 3000 inhabitants, and is celebrated for the battle fought there between Napoleon and the allies—Russians and Prussians—under Bennigsen, February 8, 1807. The French force amounted to about 80,000, and the allies numbered 58,000, but were superior in artillery. The battle was opened soon after daylight by a furious attack made by the French left on the Russian right and centre, which, however, proved utterly unsuccessful, the attacking corps being all but completely destroyed. The murderous struggle was repeatedly renewed, and the promise of victory alternated now to the one side and now to the other. Night closed upon the whole allied line pressing onward and driving the French before them. Nevertheless, the victory is generally claimed by the latter, chiefly because the allied forces, unable to recruit their strength, were ordered to retreat from the field on the night of the battle, and to retire upon Konigsberg. The loss of the allies is estimated at about 20,000, while that of the French must have been considerably greater.

EZE'KIEL (meaning 'God will strengthen,' or 'strength of God'), one of the Hebrew prophets, was the son of the priest Buzi, and along with Jehoiachin, king of Judah, was carried captive, when still a young man, to Mesopotamia, by order of Nebuchadnezzar, about 598 B.C. He was a member of the Jewish community which settled on the banks of the river Chebar, and first appeared as a prophet about the year 594 B.C. His prophetic career extended over a period of 22 years. The date of his death is not recorded.—The book of Ezekiel consists of three great parts: the *first* (chapters 1—24), composed before the final conquest of Jerusalem by Nebuchadnezzar, announces the complete overthrow of the kingdom of Judah, on account of its increasing unfaithfulness to God; the *second* (chapters 25—32) threatens the surrounding nations, which were exulting maliciously over the ruin of Judah, with divine punishment; and the *third* (chapters 33—48) prophesies the future deliverance of the Hebrew nation, and the rebuilding of Jerusalem. This last portion is generally believed to contain several Messianic predictions, three of which are considered specially remarkable (chaps. 36—37, 38—39, and 40—48); and it is beyond all question that only under a world-wide dispensation like the Christian, can the glorious visions of the prophet receive a historical realisation. The book is full of magnificent but artificial symbolism, and of allegories difficult to understand; whence Jerome calls it 'a labyrinth of the mysteries of God;' but here and there, as in chapters 1st and 2d, it contains visions that indicate the possession on the part of E. of a most vivid and sublime imagination. E.'s authorship of the book has been questioned. The Talmud says, it was written by the Great Synagogue, of which E. was not a member; and Ewald, believing that traces of later elaboration are quite obvious, suggests that the collection and combination of the various prophecies into a book may not have been the prophet's own doing. The opinion of most critics, however, is, that a prophet who was so much of a literary artist as E., was more likely to have completed the book himself than to have left such a work to others. The text is far from being in a perfect condition. It is partly corrupted by glosses, has partly been retouched by later hands, and may often be amended by the Septuagint version. The best commentaries on the book of Ezekiel are those of Hävernick (Erlangen, 1843) and Hitzig (Leip. 1847).

E'ZRA, a Jewish lawgiver of the 5th c. before Christ. He was descended from a distinguished priestly family, and was resident in Babylon in the reign of Artaxerxes Longimanus. With this monarch he seems to have been in considerable favour, and in the year 478 B.C. obtained permission to return to Jerusalem with a band of his countrymen amounting to 1754. His services to the new colony in regard to their civil and religious condition were very important. He endeavoured to re-impose more strictly the law of Moses, forbidding marriages with heathen women, and disannulling such ties where they had been formed. He also introduced into Jewish literature the square Chaldee character, instead of the old Hebrew or Samaritan one, which had been customary till then; but the tradition that he re-wrote from memory the sacred books burned at the destruction of the temple, deserves no regard; and it is likewise a mere tradition that as president of the so-called Great Synagogue (an assemblage of Jewish scholars) he arranged and completed the canon of the Old Testament. See BIBLE.—The book called by his name, along with the book of Nehemiah, formed, among the Jews, the first and second books of Ezra. It records events which extended over a period of nearly 80 years, and divides itself naturally into two parts. The first six chapters embrace a period of 21 years, and relate the history of the first return from the Babylonish captivity; the rest of the book chronicles the *second* return under Ezra the priest, in the reign of Artaxerxes Longimanus. The book is partly written in Chaldee, and is probably the work of various authors.

F

F THE sixth letter in the Latin and English alphabets, corresponding to the *Vau* of the Hebrew, and the *Digamma* (q. v.) of the old Greek alphabet. See ALPHABET. F and v are called *labio-dentals*, from the organs employed in producing them; they belong to the class of consonants called Aspirates (q. v.), and bear the same relation to each other that exists between the unaspirated labials *p* and *b*. In Latin, *f* had a peculiar sound, different from that of Greek φ, as we learn from Cicero and other Latin writers. What the sound was, we do not exactly know, but it approached to the nature of a strongly breathed *h*, as is indicated by the fact, that in the Sabine dialect it sometimes takes the place of *h*, as Sab. *fircus* = Lat. *hircus* (a he-goat); and the Latins made use both of *faba* and *haba* for 'a bean.' This affinity is also shewn in modern Spanish, where *h* takes the place of the Latin *f*; as Lat. *femina*, Sp. *hembra; fl* becomes, in Spanish, *ll*, as Lat. *flamma* = Sp. *llama*. F, in English and other Teutonic tongues, corresponds to *p* in Greek and Latin; as Lat. and Gr. *pater* = Eng. *father;* Gr. *pod-*, Lat. *ped-* = Eng. *foot;* Lat. *pisc-* = Eng. *fish;* Gr. *pur* = Eng. *fire;* Lat. *vulp-* = Eng. *wolf*. In some words, *v* takes the place in German of *f* in English; as Ger. *vater* = Eng. *father;* Ger. *vier* = Eng. *four*. In the Aberdeenshire dialect, *f* takes the place of *wh*, as *fat* for *what; fup* for *whip*. This seems to be a relic of the Teutonic pronunciation of *w* (= *v*), still to be observed in the Cockney pronunciation of *vill* for *will*, *ven* for *when;* but why the sharpening of the labial into *f* should be confined to one circumscribed district of Scotland, and to the case of *w* followed by *h*, it is hard to say.

F in Lat. and Greek becomes *b* in Eng.; as Gr. and Lat. *fer-* = Eng. *bear;* Lat. *frater* = Eng. *brother*. See Letter B.

More remarkable are the interchanges between *f* and the series *d, th, t*. Lat. *foris* = Gr. *thura*, Eng. *door;* Lat. *fera* = Gr. *ther*, Eng. *deer;* Eng. *red*, Sans. *ruthira*, Gr. *eruthros*, Lat. *rutilus*, *rufus*, *ruber*. In Russian, *Feodor*, *Afanasja* = *Theodor*, *Athanasia*. In words originally common to both Greek and Latin, the Greek φ is represented in Lat. by *f;* as Gr. φημη = Lat. *fama*. But in spelling Greek words with Latin letters, the Romans, after the time of Cicero, were careful to represent φ, not by *f*, which had a somewhat different power, but by *ph*. This mode of spelling words derived from Greek is still adhered to in English, German, and French, although the distinction in sound has long been lost sight of. The distinction began to disappear in the Latin itself in the time of the later Roman emperors, when inscriptions shew such spelling as *Afrodite* for *Aphrodite;* and this simplification is followed in modern Italian, Spanish, and Portuguese. *Ph* is sometimes erroneously used in words having no connection with Greek; as Adolphus, for the Teutonic Adolf or Adalolf—i. e., 'noble wolf.'

F, in Music, is the fourth note of the natural diatonic scale of C, and stands in proportion to C as 4 to 3, and is a perfect fourth above C as fundamental note. F major, as a key, has one flat at its signature—viz., B flat. F minor has four flats the same as A flat major, of which it is the relative minor.

FAAM, or **FAHAM** (*Angræcum fragrans*), an orchid, native of India and the Mascarene Isles, much prized in the East for the delightful fragrance of its leaves, which is owing to the presence of *Coumarin* (q. v.), and resembles that of the Tonka Bean and of Vernal Grass. In the Isle of Bourbon, an infusion of F. leaves is in great repute as a cure for pulmonary consumption and as a stomachic. In France, it has been successfully employed, under the name of *Isle of Bourbon Tea*, as an expectorant, anti-spasmodic and stomachic.

FABACEÆ. See LEGUMINOSÆ.

FA'BER is the name of two artists, father and son. John F., the elder, was born in Holland, where he acquired a knowledge of the art of mezzotinto-engraving. Subsequently, he came to England, and died at Bristol, May 1721. His works do not exhibit much talent.—The younger F., also called John, obtained, however, a high reputation as an engraver in mezzotinto. His principal works are the portraits of the Kit-Cat Club, and the Beauties of Hampton Court, several of which are executed with great freedom, vigour, and beauty. F. lived in London, where he is believed to have died in 1756.

FABER, REV. GEORGE STANLEY, a learned and voluminous divine of the Anglican Church, was the eldest son of the Rev. Thomas Faber, and was born 25th October 1773. He entered University College, Oxford, in 1789, where he achieved a brilliant academical reputation. Before his 21st year, he was elected Fellow and Tutor of Lincoln College. In 1796, he took his degree of M.A.; was Bampton Lecturer for 1801, in which capacity he delivered the lectures subsequently published under the title of *Horæ Mosaicæ;* and in 1805 became vicar of Stockton-on-Tees, in the county of Durham. After several changes, he received from Bishop Van Mildert, in 1832, the mastership of Sherburn Hospital, near the city of Durham, where he died 27th January 1854. F. wrote upwards of forty works, several of which, especially those upon prophecy, have enjoyed a very extensive popularity. All his writings are marked by 'strong masculine sense, extensive classical erudition, and a hearty love of hypothesis.' The principal are—*The Genius and Object of the Patriarchal, the Levitical, and the Christian Dispensations* (1823, 2 vols.); *The Difficulties of Infidelity* (1824); *The Sacred Calendar of Prophecy* (1828, 3 vols.); *The Primitive Doctrine of Election* (1836), reckoned by some critics the most valuable of all F.'s writings; *The Primitive Doctrine of Justification* (1837); and *Eight Dissertations* *upon the Prophetical Promises of a Mighty Deliverer* (1845, 2 vols.).

FA'BIUS, the name of one of the oldest and most illustrious patrician families of Rome. Three brothers of this name alternately held the office of consul for seven years (485—479 B. C.). In 479, the Fabii, under K. Fabius Vibulanus, migrated to the banks of the Cremera, a small stream that flows into the Tiber a few miles above Rome. Here, two years after, they were decoyed into an ambuscade by the Veientes, with whom they had been at war, and, with the exception of one member, who had remained at Rome, and through whom the race was perpetuated, the entire *gens*, consisting of 306 men, were put to the sword. The most eminent of the Fabii were Quintus Fabius Rullianus —supposed to have been the first who obtained for himself and his family the surname of *Maximus* —and his descendant, Quintus Fabius Maximus Verrucosus, named Cunctator, the Delayer. The former was the most eminent of the Roman generals in the second Samnite war, and was twice dictator, and six times consul. The latter, who, in the course of his career, was five times consul, and twice censor, was elected dictator immediately after the defeat of the Romans at Trasimenus. The peculiar line of tactics which he observed in the second Punic war obtained for him the surname by which he is best known in history. Hanging on the heights like a thundercloud, to which Hannibal himself compared him, and avoiding a direct engagement, he tantalised the enemy with his caution, harassed them by marches and counter-marches, and cut off their stragglers and foragers, while at the same time his delay allowed Rome to assemble her forces in greater strength. This policy —which has become proverbial as 'Fabian policy' —although the wisest in the circumstances, was neither appreciated in the camp nor at home; and shortly after, Marcus Minucius Rufus, Master of the Horse, was raised to an equal share in the dictatorship, a position, however, which he occupied but for a short time. During his fifth consulship, Fabius recovered Tarentum, which had long been one of Hannibal's important positions. He died in 203 B. C. C. Fabius, surnamed Pictor, executed upon the walls of the temple of Salus—dedicated by the dictator C. Junius Brutus Bubulus in 302—the earliest Roman paintings of which we have any record; and his grandson, Q. Fabius Pictor, was the first writer of a Roman history in prose.

FA'BLE (Lat. *fabula*) is a word of twofold signification. First, it is employed by some writers in a general sense to denote any fictitious narrative, as, for example, the incidents in an epic or dramatic poem. At one time also, when the myths of the Greeks and Romans were thought to be satisfactorily accounted for by regarding them as conscious inventions of the ancient poets and priests, it was customary to speak of them as *fables*, but this application of the term is now abandoned by scholars. See MYTHS. According to the second and more frequent signification of the word, it denotes a special kind of literary composition, either prose or verse, in which a story of some kind is made the vehicle for conveying a universal truth. It differs from a parable in this respect, that while the latter never transcends in conception the bounds of the probable or the possible, the former always and of necessity does. The story of the 'Good Samaritan' imagined by the Saviour, is a parable; if it was not true, it might have been, for it contains nothing either improbable or impossible; but when Jotham went up to the top of Mount Gerizim, and spoke to the men of Shechem about the trees going forth to anoint a king over them, he made use of a fable proper. The peculiarity, therefore, of the *structure* of the fable consists in the transference to inanimate objects, or, more frequently, to the lower animals, of the qualities of rational beings. By the very novelty and utter impossibility of the representation, the interest of the hearer or reader is excited, and thus its symbolic meaning and moral become transparent to him, at least if the fable is well contrived. The ancient fabulists were simple, clear, and earnest in their representations. They seem to have sprung up in the East. Among the more celebrated are Bidpai (q. v.), or Pilpai, and the Arabian Lokman, who is said to have lived in the time of King David. Among the Greeks, the greatest name is that of Æsop (q. v.), whose fables, at a much later period—the precise time is not exactly known—were versified by a certain Babrius (q. v.). Among the Romans, Phædrus cleverly imitated Æsop, but with considerable modifications, thus giving a certain amount of independent value to his work. It is perhaps worth mentioning here, that the well-known fable of the *Town Mouse and Country Mouse*, told by Horace, is of purely Roman origin, and is probably the only one in existence of which that can be affirmed. Leaving the classical period, and before entering on the dark ages, we encounter the name of Aphthonius, who flourished in the early part of the 4th century, and who wrote indifferent fables in Greek prose; and still later, the name of Flavius Avianus, who composed forty-two, no better, in Latin elegiacs. During the dark ages, the fable in various forms appears to have been cultivated in the monasteries, although nothing meritorious has survived; but in the middle ages, it acquired fresh life and vigour. An edition of the fables current in Germany in the time of the Minnesingers has been published by Bodmer. The oldest known German fabulist is Stricker, who lived about the middle of the 13th c.; but the famous medieval fable of *Reineke Fuchs* (q. v.), or the History of Reynard the Fox, stretches in some of its numerous primitive forms much further back. In later times, most nations have cultivated the fable with more or less success. We may mention among the English, Gay; among the Germans, Hagedorn and Gellert, and Lessing; among the Italians, Pignotti; and above all, among the French, La Fontaine, whose fables are remarkable for their arch and lively humour, their delicate sarcasm, their sagacity, and felicity of expression. Now, however, the fable has gone entirely out of fashion, and there seems little chance of its reappearance.

FABLIAU, plur. **FABLIAUX** (from the Latin *fabulari*, *fabellare*, to speak or to tell), was the name given in the old French literature to a class of short metrical narratives, intended merely for recitation, and which had for their subject-matter the talk and news of the day in the middle ages. The narrator of such news was called a *fableor* (plur. *fablière*), in opposition to the *chanteor*, or singer proper, who composed poems not only for recitation, but also for singing. Besides the fabliaux, the department of the fableor embraced the *Romans d'aventure* (in short unstrophied couplets), usually called *contes*, whence their author or reciter also bore the name of *conteur;* and the *dits*, or sayings, the special cultivator of which was termed a *diseur*. As the fabliaux were fundamentally distinguished from the more genuine forms of poetry by the everyday character of their subject-matter, so the mode of treatment which their authors adopted was also more anecdotical, epigrammatic, and witty—the wit being richly spiced with scandal. They appear to have maintained a sort of ironical and parodistic antagonism to the idealism of the epics of chivalry. In these fabliaux, the essential character of the French people manifested itself, and that opposition of the real to the ideal, of the understanding to the imagination, which, after the time of Francis I., began to characterise French literature generally. Thus they lashed not only the priesthood and the nobility in their actual degeneracy, but from the very character of their satire, they engendered a contempt for the religious-chivalric spirit itself, and for all ecclesiastical and knightly notions and ceremonies. The oldest fabliaux are not of French origin; they are a fruit of the Crusades, and were brought to France from the East, but they received a national colouring, and soon took root in the West. From them sprung the drama of France. One of the most fecund fablière was Rutebeuf, who flourished in the reigns of Louis IX. and Philippe III., whose works were published by Jubinal (2 vols., Paris, 1837). He was a true Parisian, and the prototype of Villon, La Fontaine, and Voltaire. The best collections of fabliaux and contes are those of Barbazan (3 vols., Paris, 1756), of Méon (2 vols., Paris, 1823), and of Jubinal (2 vols., Paris, 1839—1843).

FABRE'TTI, Raffaele, a distinguished antiquary and archæologist, was born at Urbino 1618, and was attracted at an early period to antiquarian studies by the great classical remains of Rome. Under Pope Alexander VII., he became papal treasurer, and subsequently was appointed chancellor to the papal embassy at Madrid. A residence of 13 years in Spain enabled him to explore all the antiquities of the kingdom, and to carry his studies to a point which rendered indispensable his return to Rome, the great parent fount of ancient learning. He was there made judge; and under Innocent XII., became keeper of the papal archives of the castle of St Angelo, a post which afforded the widest scope to his favourite pursuits. About this time, he wrote his two important works: *De Aquis et Aquaductibus Veteris Romæ* (4 vols., 1680, reprinted with notes and additions in 1788), and *Syntagma de Columnâ Trajani* (Rome, 1683). His treatise entitled *Inscriptionum Antiquarum Explicatio* (1699) throws invaluable light on the discoveries made by himself in the catacombs; and his erudite investigations concerning the reliefs known as the Iliac Tables, and the grand subterranean canals of the Emperor Claudius, are equally full of interest to science. His rare collection of inscriptions, &c., is deposited in the ducal palace of Urbino. F. died in 1700.

FABRIA'NO, a city of Italy, in the province of Macerata (formerly part of the Papal States), is situated at the eastern base of the Apennine range, 28 miles west of Macerata. It has a cathedral, and several convents, but is chiefly worthy of mention on account of its great paper manufactures, which were established in 1564. F. has also numerous tanneries and powder-mills, and manufactures of hats and cloth. Pop. 7030.

FABRIANO, Gentile da, an Italian painter, who flourished in the early part of the 15th century. He was born—it is not exactly known when—at Fabriano, and received his first instructions from his father, who appears to have been a man of superior culture, as he taught his son the elements of physics and mathematics. F.'s first teacher in art was, it is supposed, Allegrette de Nuzio. Subsequently, he went to Florence, and studied under Fiesole. Among his earliest works of note is a fresco of the Madonna in the cathedral of Orvieto. In 1423, he painted an 'Adoration of the Kings' for the church of the Holy Trinity in Florence. This picture is one of the most admirable belonging to the school of Giotto. To the same period belongs a Madonna with Saints (now in the Berlin Museum). F. afterwards went to Venice, where he greatly increased his reputation by a picture of the bloody engagement between the fleet of the Republic and that of the Emperor Barbarossa off the heights of Pirano. The Venetian senate was so delighted with the piece, that it conferred on the fortunate artist the dignity of a patrician, and a pension of a ducat *per diem* for life. Unhappily, this work has perished. Pope Martin V. now called F. to Rome, and employed him, along with Vittore Pisanello, in adorning the church of San Giovanni Laterano. As his share of the work, he painted various incidents in the life of John the Baptist, five prophets, and portraits of Pope Martin himself and ten cardinals. He died, while engaged on this building, some time after 1450. F.'s pictures indicate a cheerful and joyous nature. He had quite a childlike love of splendour and rich ornamentation, but is never extravagant or excessive in his colouring.

FABRI'CIUS, or FABRI'ZIO, Girolamo, commonly named from his birthplace F. ab Acquapendente, a celebrated anatomist and surgeon, was born in 1537, and died in 1619. He was the son of humble parents, who, notwithstanding their poverty, sent him to the university of Padua, where, in addition to the usual instruction in the classics, he studied anatomy and surgery under the celebrated Fallopius with such success, that on the death of the latter in 1562, F. was appointed to fill the vacant professorship. He continued to hold this office for nearly half a century, during which period his high character for eloquence, general erudition, and professional knowledge, attracted students from all parts of the civilised world to the university of Padua. Amongst these students was our countryman Harvey (q. v.), who attended his prelections in 1598, and who, as will be seen in our notice of his life, derived from F.'s observations on the valves of the veins the first clue to his great discovery. He was a most laborious investigator of nature; and we find him comparing and contrasting the same organ in man, and in several of the lower animals, on a more methodical plan than had been attempted by any of his predecessors. In this way he treated of the eye, the larynx, the ear, the intestinal canal, the development of the fœtus, and many other subjects. The improvements which his knowledge of anatomy enabled him to introduce into the practice of surgery were very great; and his *Opera Chirurgica*, which embraced every complaint curable by manual operation, was so highly valued, that it passed through seventeen editions. He was greatly esteemed by his fellow-citizens, for we find that the Venetian republic not only erected for him a spacious anatomical amphitheatre, in which his name was inscribed, but at the same time conferred upon him an annual stipend of a thousand crowns, and created him a knight of the order of St Mark. A few years before his death, he retired, with an ample fortune, from all professional duties, and died (some believe he was poisoned by his relatives) at the age of 82, in his villa on the banks of the Brenta, which still bears the name of the Montagnuola d'Acquapendente. We have not space for a list of his numerous anatomical and surgical works. Upwards of a century after his death (in 1723), the celebrated anatomist Albinus collected and published a complete edition of all his anatomical and physiological works.

FABRICIUS, Joh. Christian, a Danish entomologist, born at Tondern, January 7, 1745, and died at Kiel in 1807. He studied at Copenhagen, Edinburgh, Leyden, and Freyberg, and finally went to Upsala, to attend the classes of Linnæus. A warm friendship was cemented between master and pupil, and throughout his life, F. was zealously employed in developing and applying the ideas and method of the great Swede. In 1775, F. was appointed to the chair of Natural History at the university of Kiel, and from that time he devoted himself to the prosecution of his entomological studies, and to the fuller development of a system of classification of insects, based upon the structure of the mouth. Although his system has been found inapplicable to many families of insects, the observations on which it was based have tended materially to the extension of this branch of science. The *Systema Entomologiæ* (Copenh. 1775), in which F. expounded his views, constituted a new era in the history of entomology, while his *Genera Insectorum* (Kiel, 1776), *Mantissa Insectorum* (Copenh. 1787), and *Entomologia Systematica* (Copenh. 1792), opened hitherto unexplored fields of inquiry to the entomologist. F. was the author of several able treatises on the policy, statistics, and economy of Denmark, which were prepared by him in his capacity of councillor of state and Professor of Rural and Political Economy at Kiel. F.'s death was said to have been hastened by the grief which he experienced in consequence of the political misfortunes of his country.

FABRO'NI, ANGELO, an excellent biographical writer, was born at Marradi, in Tuscany, 7th February 1732, educated at Faenza and Rome, and in 1773, was appointed tutor to the sons of Leopold, Grand Duke of Tuscany. He died 22d September 1803. His *Vitæ Italorum Doctrina Excellentium qui Sæculo XVII. et XVIII. floruerunt* (20 vols., Pisa, 1778—1805), is one of the best Italian works of its kind, and contains quite a treasure of information; while his *Laurentii Medicei Vita* (2 vols., Pisa, 1784), and *Vita Magni Cosmi Medicei* (2 vols., Pisa, 1788—1789), are reckoned model biographies.

FAÇADE (Fr.), the exterior front or face of a building. This term, although frequently restricted to classic architecture, may be applied to the front elevation of a building in any style. It is, however, generally used with reference to buildings of some magnitude and pretensions; thus, we speak of the *front* of a house, and the façade of a palace. The back elevation of an important building is called the rear façade, in the same way as in England the back of a house is called the '*back front*.'

An edifice may have any number of façades when it shews a face or front in each direction. An elevation of the side of a building is called the *lateral* façade. The sides of a court or cortile are also called façades, and are distinguished as north, south, &c. façades.

FACCIOLA'TI, JACOPO, an Italian philologist and critic, was born at Torreglia, not far from Padua, in 1682. He was educated in the religious seminary at Padua, where he became successively Professor of Theology, Professor of Philosophy, and Superintendent-general of the classes, or rector of the institution. F. directed his attention chiefly to the revival of the study of ancient literature, and with this object, brought out a new edition of the *Lexicon Septem Linguarum*, called, from its original author, the monk Ambrosius of Calepio, the *Calepine Lexicon*. He was assisted in this work by his pupil, Forcellini, to whom is mainly owing the conception of a totally new Latin dictionary; an arduous undertaking, which F. continued till his death in 1769, and which was afterwards completed by Forcellini in 1771. F. and Forcellini, assisted by several others, likewise published a new edition of Nizoli's *Thesaurus Ciceronianus.* F.'s Latin epistles and orations are remarkable for the Ciceronian elegance of their style, and his notices on several philosophical writings of Cicero for their solidity, clearness, and taste.

FA'CET, a term employed to denote the plane surfaces of crystals, or those artificially cut upon precious stones.

FACIAL ANGLE. See ANGLE.

FACI'LITY, in the legal terminology of Scotland, is a condition of mental weakness short of that which will justify *Cognition* (q. v.), but which calls for the protection of the law, which is exercised by means of a process called Interdiction (q. v.). The object of interdiction is to prevent the facile person from granting deeds to his own prejudice, and after it has taken place, he cannot contract without the consent of his interdictors. Even without interdiction, the deeds of a facile person, if to his prejudice, may be set aside, if there be proof of his having been circumvented or imposed on; and Erskine says that 'where lesion in the deed, and facility in the granter concur, the most slender circumstances of fraud or circumvention are sufficient to set a deed aside.'—B. iv. tit. 1, s. 27. See FRAUD, LESION, INSANITY. There is no corresponding term in English law, and the remedy of interdiction is unknown, but weakness of mind approaching to idiocy will of course form an important element in proving fraud.

FA'CTOR, in Mathematics. The numbers 6 and 4, multiplied together, *make* 24; hence 6 and 4 are called *factors* of the product 24. Most numbers are products of two or more factors; thus $10 = 2 \times 5$; $12 = 3 \times 4$, or 2×6, or $2 \times 2 \times 3$. Every product can be divided by any of its factors without remainder; a factor, therefore, is often called a *divisor*, or measure. 2, 3, 4, 6, 8, 12, are all factors or divisors of 24. Numbers that have no factor or divisor above unity, such as 2, 3, 5, 7, 11, . . . 23, &c., are called *Prime* Numbers (q. v.).

FACTOR, in its most general sense, is the term applied to any one who is employed to do business for another. Factory differs from the mandate of the Roman law in not being gratuitous. In mercantile transactions, the sale of goods is generally effected either by factors or brokers, both of whom are agents, remunerated generally by a commission. But the powers of factors are higher than those of brokers, inasmuch as the former are intrusted with the possession of the goods, and authorised to sell them as if they were their own; whereas the latter have no possession or apparent ownership, but act not only really but ostensibly as agents. Factors frequently act on the principle of the *del credere commission* (q. v.), receiving, that is to say, a higher remuneration in consideration of undertaking to guarantee the solvency of the purchasers. At common law, a sale or other transaction by a factor was bad, if it was not fully warranted by the nature of the authority which he derived from his principal; but this doctrine has been modified by several statutes which have been passed for the protection of strangers dealing with persons intrusted with the possession of goods, the extent of whose authority they had no means of ascertaining. By 6 Geo. IV. c. 94, called the Factors' Act, it was provided that any person in possession of a bill of lading is to be deemed the true owner of the goods therein described, so far as to give validity to any contract or agreement made with him regarding them. 7 and 8 Geo. IV. enacts that if any factor shall, for his own benefit, and in violation of good faith, deposit or pledge any goods, or order for their delivery, he shall be guilty of a misdemeanour. In 1842, the powers of 6 Geo. IV. c. 94 were defined and extended by 5 and 6 Vict. c. 39, which enacted that *bonâ fide* advances to persons intrusted with the possession of goods or documents of title, though known to be agents, should be protected; *bonâ fide* deposits in exchange were also protected, but it was provided that there should be no lien beyond the value of the goods given up. The agent's responsibility to his principal is not diminished, but it is provided that if he shall make consignments contrary to the instructions of his principal, he shall be guilty of a misdemeanour.

In Scotland, the term factor is applied to an agent managing heritable estates for another, letting farms, drawing rents, and the like, in which sense it is nearly synonymous with the English *steward*, a term which, in Scotland, again, is employed to denote an agent whose powers are of a far more limited kind than those of a factor, and who generally acts under him. If a factor pay money into a bank on his own account, he takes the risk of the bank's failure. A factor cannot delegate his powers, but he may employ a third party to aid him in their discharge. He binds his principal to any engagement which he contracts within his powers. Factory may be recalled, and falls by the death of the principal; but actions already begun may go on, and those done in ignorance of the revocation or death are binding. Revocation is implied in the appointment of a new agent to do the same act. The mandate of factory subsists notwithstanding the supervening insanity of the mandant. Factors may be empowered to grant leases and pursue removings, but for these acts special powers are required. Writers to the Signet in Edinburgh, and writers in country towns, frequently act as factors for the neighbouring landed proprietors. But all the great landowners had formerly, and many of them still have, factors resident on their estates. See AGENT.

FA'CTORIES are establishments where large numbers of persons co-operate in the production of some article of consumption, the principle of the division of labour being in all cases applied, and generally machinery to a greater or less extent. The factory-system is opposed to the practice of individual labour at the homes of the artisans. Every production of art requires a longer or shorter series of operations, often varying considerably in their nature. The hand-worker performs most of these himself; one and the same person makes the complete article. In a factory, every article goes through as many hands or machines as there are separate processes required; each workman performs only one, and that always the same, process. The chief advantages of this way of proceeding are the following: Loss of time is avoided in passing from one operation to another, a loss which is the greater, the greater the difference in the nature of the operation. The workman, confined to one thing, in itself usually simple, not only learns it sooner, but attains a quickness and skill that one distracted with a variety of operations can never attain; besides, the constant occupation with one kind of work leads the workman to light upon improvements in tools and machines so as to increase their rapidity of execution and their precision. As only few of the processes are very difficult, it is possible to turn to some account less skilful workmen, and even children, and to assign to each person that kind of work at which he is most effective. All parts of the work, too, that are quite uniform in the case of each article, can generally be done by machinery. Lastly, in factories, there is more opportunity of turning to advantage all kinds of refuse.

A necessary consequence of these advantages is, that the cost of production is less on the factory-system than in the other way; and more than that, the articles themselves, when of a nature adapted to this mode of production, are better, and of a uniformity otherwise unattainable. Wherever a comparatively homogeneous material has to be made into a large number of uniform articles, there the factory-system is in its proper place. The best examples are spinning, weaving, cloth-printing, pin and needle making, &c. But even in the manufacture of complex articles composed of different kinds of material, the factory-system may be pursued with advantage whenever the number of the articles required is great, and the separate parts of such a kind that a great number can be made exactly alike. This is the case with watches, weapons, locks, &c. Such a manufacture divides itself into as many separate employments as there are parts in each article, and the putting together and adjusting forms another. The degree of complexity is carried still further in such cases as the manufacture of carriages, where operations of the most heterogeneous kind have to concur. In some cases, factories do not concern themselves with the putting together of the parts, but merely produce them for hand-workers and special professionists, as is the case in watch-making. In making clothes and shoes and the like, where each individual article requires special adaptation, factory work is not so suitable. How far it is advisable in any case to employ machinery, depends on the nature of the work, the cost of the machinery, the scale on which operations are to be carried on, &c. Nowhere have the factory-system and the employment of machinery been carried further than in America. In Cincinnati, for instance, one establishment in 1854 produced 200 dozen chairs a week, another 1000 bedsteads, most of the work being done by machinery; and one boot and shoe factory used 600 bushels of shoe-pegs. Even the killing of pigs is done on this grand scale, one establishment killing and pickling 12,000 hogs and 3000 oxen in a season.—Factories cannot succeed in great numbers except in localities where the population is sufficiently dense to afford a sufficient choice of hands, and also to cause a comparatively low rate of wages. Other conditions of a good locality for factory production are abundance of water-power or the presence of coal for steam power, nearness to the raw material, and good communications.

While the rise and extension of the factory-system, when looked at from the point of view of material economics, must be pronounced a decided improvement, it cannot be denied that, socially and politically considered, it has its dark side. The greater the capital and the training necessary for carrying on an extensive establishment, the less prospect the workman has of ever raising himself to independence. The chasm that separates the mill-owner from his dependants is infinitely greater than that which exists between a master artisan and his journeymen. The hope of gradual advancement afforded in the last case supplies a powerful moral support and means of discipline; the impassable gulf in the other acts as a stumbling-block and temptation. Factory-workers are especially disposed to enter heedlessly into marriage, as they require to make no provision for a workshop, tools, and other outlay once necessary for entering life; while they have the prospect of the wife, and soon of the children, as contributors to the support of the family. It may, at all events, be affirmed, that the increase and accumulation in masses of the class called *proletaires*, who have no provision for a week but the labour of that week, is favoured by the factory-system. Moreover, the employment of wife and child as fellow-labourers endangers the old and sacred bonds of the family; the father can no longer remain, to the extent that he ought to be, master of the house of which he is no longer the sole support; and how much the family affection is thus weakened, is painfully exhibited in the ill-treatment of the younger children, who are prematurely put to labour, and literally robbed of their childhood. At the same time, it cannot be allowed that these evils are incapable of remedy; legislation and public opinion can here do much; nor must it be forgotten that the evil is not peculiar to factory labour, but is a feature of the whole of our more recent industrial economics. The greatest abuses of the kind in England are found in the mining districts, and among the small domestic manufacturers. The very circumstances that give rise to the evils afford the means of obviating them, if they were only taken advantage of; for, the larger the establishment, the more good can an owner do for his people, and the less it is possible to conceal abuses. It cannot with justice be charged against factory labour that in itself it has a demoralising tendency. Whatever brings together numbers of human beings increases, no doubt, opportunities and temptations to aberrations, especially in the intercourse of the sexes; but not more so in the case of a factory than in that of all large towns, and even less so than in some other cases of assemblage, as armies and garrisons.

FACTORY ACTS. From motives of humanity, several statutes have been passed in recent years for regulating the hours of work, preserving the health, and promoting the education of young persons employed in mills and factories. The leading act is 7 and 8 Vict. c. 15; though much had already been done by the old statute 42 Geo. III. c. 73, and by 3 and 4 Will. IV. c. 103, commonly called the Factory Act, amended by 4 Will. IV. c. 1. By these last-mentioned acts, night-work—that is, between half-past eight in the evening and half-past five in the morning—was, with some exceptions, forbidden in the case of persons under eighteen years of age; whilst their hours of labour were limited to twelve in the day, including one and a half hours for meals. The employment of children under nine was prohibited, except in silk-mills; and under thirteen the hours were restricted to eight a day, or ten in silk-mills. Holidays were allowed, and certificates of health required from a surgeon or physician previous to the admission of a child into a factory, under certain penalties. By 3 and 4 Will. IV. c. 103, also, inspectors of factories were appointed, and their powers and duties for its enforcement defined. Amongst the duties of the inspector was included that of seeing that every child within the restricted age was placed at school; and in case of the parents or guardians of the child omitting to provide for his education, to order the employer to pay to him (the inspector) one penny in every shilling of the weekly wages of the child, to be applied to that purpose. By 7 and 8 Vict. c. 15, the powers and duties of inspectors were more accurately set forth. Regulations are laid down for the protection of children working in web-spinning flax-mills, and it is enacted that the mill-gearing shall not be cleaned while in motion, and that the machinery shall be guarded. A child is defined to mean a person under thirteen; and a young person, one between the ages of thirteen and eighteen. An abstract of the act and relative notices must be hung up in every factory. As to the time of children's work, it is provided that they shall not be employed more than six hours and thirty minutes in any one day, or seven in silk factories; but they may be employed ten hours in one day on three alternate days of the week, provided that they be not employed in any manner in the same, or any other factory, on two successive days, or after half-past four on a Saturday. On the vacant days, the children are to be sent to school for five hours, provided the day be not a Saturday, when no school attendance of any child shall be required. Women above the age of eighteen are to be employed as young persons; and work for all children and young persons is to cease on Saturday at half-past four. In addition to the regulations of the former act, it is provided regarding meal-times, that the hours allowed shall be between half-past seven in the morning and half-past seven in the evening, and that one hour shall be before three o'clock. No child or young person shall be employed more than five hours before one o'clock without an interval for meal-time of at least thirty minutes. All young persons are to have their meal-times at the same hour, and are not to be allowed to remain in any of the rooms used for manufacturing processes. Eight half-holidays are to be given in every factory, in addition to Good-Friday and Christmas-day, and the sacramental fast-day in Scotch parishes. By the subsequent act, 16 and 17 Vict. c. 102, it is required that no person under thirteen shall be employed in a factory before six o'clock in the morning or after six in the evening; or on Saturday after two o'clock; but between September 30 and April 1, children may for one month be employed on any day but Saturday from seven in the morning till seven in the evening. By 8 and 9 Vict. c. 29, the powers of inspectors and the regulations in respect to the employment of women and children, are extended to calico-works; and rope-works are expressly exempted from them by 9 and 10 Vict. c. 40. By 10 Vict. c. 29, the hours of labour for young persons, and women above the age of eighteen, are reduced from twelve, which the factory act had fixed, to ten after 1st May 1848; and by 13 and 14 Vict. c. 37, it is enacted that the same persons shall not be employed before six in the morning or after six in the evening, or after two o'clock on a Saturday. Meal-times must be between half-past seven in the morning and six in the evening. There are partial exceptions to the hours specified in the acts, for the recovery of lost time; and by 13 and 14 Vict. c. 37, children above eleven are to be viewed as young persons when employed in winding and throwing silk. 19 and 20 Vict. c. 38, limits the provisions of 7 and 8 Vict. c. 15, as to mill-gearing, to those parts with which children and young persons and women are liable to come in contact, either in passing or in their ordinary work in the factory.

FA'CULÆ (Lat. *facula*, a torch), in Astronomy, are spots, brighter than the rest of the surface, which are sometimes seen on the sun's disc. See SUN.

FA'CULTIES, COURT OF, a court established by 25 Hen. VIII. c. 21, s. 4, whereby authority is given to the Archbishop of Canterbury and his successors to grant dispensations, faculties, &c., by himself, or his sufficient and substantial commissary or deputy, for any such matters not being repugnant to the Holy Scriptures and the laws of God, whereof before such dispensations, &c., had been accustomed to be had at the see of Rome. Up to the time of passing this act, the pope, notwithstanding the statutes which had been passed restraining his authority, continued to exercise his power, and to draw a considerable revenue for indulgences, &c. The chief officer of the court is called *magister ad facultates.* The sittings of the court have always been held at Doctors Commons (q. v.). On its first institution, there were various matters in which the dispensing power was called into exercise—such as the power to hold two or more livings (see PLURALITY), and the permission to eat flesh in Lent, &c. But of late years the matter which has chiefly occupied the court has been the granting licence to marry without publication of banns. See LICENCE, MARRIAGE, DISPENSATION.

FACULTY. See UNIVERSITIES.

FACULTY, a name applied to certain aptitudes or powers of the mind, especially those of the intellect. Reid considered that the characteristic of a faculty was its *primitive* character, as opposed to the acquired powers, or habits. Sir W. Hamilton remarks on this distinction as follows: 'Powers are *active* and *passive*, *natural* and *acquired*. Powers natural and active are called *faculties*. Powers natural and passive, *capacities* or *receptivities*. Powers acquired are habits, and habit is used both in an active and passive sense.'—Reid, p. 221. Hence, in discussing the intellect, whatever are considered its primary or fundamental functions, are its faculties. Perception, Memory, Reasoning, Imagination, are the leading intellectual faculties, according to the older metaphysicians, who followed the popular classification. These would not now be considered as giving the ultimate analysis of the intellect. Conscience, or the moral sense, has sometimes been called the *moral* faculty. See INTELLECT.

FACULTY, GRANT OF, BY THE ORDINARY, an order by the bishop of a diocese to award some privilege not permitted by common law. A faculty is necessary in order to effect any important alteration in a church, such as the erection of a gallery or of an organ. Without a faculty, a person is not entitled to erect a monument within the walls of a church. But a monument having been put up, though without a faculty, cannot be removed till a faculty or order to that effect has been obtained. By the common law of England, every parishioner is entitled to a seat in church, but no one has a claim to any particular seat, unless the right has been given by a faculty. See PEWS.

FACULTY OF ADVOCATES. See ADVOCATES.

FÆ'CES, or SOLID EXCREMENTS, are the matters which an animal ejects from the lower end of the intestinal canal, and in greater part, consist of those portions of food which, on passing through the alimentary canal, have been rejected as comparatively worthless in the office of nutrition. In the higher animals, the fæces generally contain about three-fourths of their weight of water, the remaining one-fourth consisting, in greater part, of organic remains; in the case of the ox, sheep, and other herbivorous animals, of undigested woody fibre. In the human subject, the quantity of fæces yielded daily by an average healthy man is 5 to 6 ounces; the peculiar brown colour is due to the presence of decomposing biliary matter, and the odour to partially changed nitrogenous substances resembling casein. The following table gives the composition of human and ox fæces:

Human.		Ox.	
Water,	73·3	Water,	70·00
Organic remains,	7·0	Woody fibre,	22·50
Biliary and nitrogenous matter,	14·9	Wax,	0·76
Albumen,	0·9	Sugar,	3·00
Extract,	2·7	Albumen,	2·00
Salts,	1·2	Resin and Salts,	1·74

For use as manure, these fæces are of little value as compared with guano, dissolved bones, or superphosphates, and, indeed, the principal effete matters of importance to the agriculturist are resident in the urine or liquid excrement of the higher animals. In the case, however, of birds and reptiles, the urine and fæces are voided together more or less moist, and hence the richness of such excrementitious matter, and its high agricultural value. See GUANO. The following table gives the composition of the fæces of the boa constrictor:

Uric acid,	90·16
Ammonia,	1·70
Potash,	3·45
Sulphate of potash,	0·95
Phosphate of lime, &c.,	0·80
Mucus and colouring matter,	2·94
	100 00

FAED, JOHN, a popular Scottish painter, was born in 1820 at Burley Mill, in the stewartry of Kirkcudbright, where his father was an engineer and millwright. His love of art was manifested at an early period, and when hardly entered on his teens, he was in the habit of making tours through the villages of Galloway, painting miniatures. In 1841, he came to Edinburgh, where his talents ultimately won him a high reputation. The first picture of F.'s that obtained great popularity was 'The Cruel Sisters,' the subject of which was taken from an old Scottish ballad. It was exhibited in 1851. Since then, F. has executed, among other works, 'Shakspeare and his Contemporaries,' 'Reason and Faith,' 'The Cotter's Saturday Night' (probably the most widely admired of all his efforts), 'Tam o' Shanter,' and 'The Soldier's Return.'

FAED, THOMAS, brother of the preceding, was born at Burley Mill in 1826, and has also followed the career of an artist. One of his earliest efforts was a drawing (in water-colours) from the *Old English Baron*. In 1849, he became an Associate of the Royal Scottish Academy, and shortly after executed a very attractive work, entitled 'Scott and his Friends at Abbotsford.' In 1852, he removed to London, where his 'Mitherless Bairn,' exhibited in 1855, was declared by the critics to be 'the picture of the season.' Of his subsequent works, we need only mention, 'Home and the Homeless,' and 'The First Break in the Family,' the latter of which is remarkable for its simple and homely pathos.

FAE'NZA, a town of Italy, in the province of Ravenna, and 20 miles south-west of the town of that name, is situated on the left bank of the Lamone, in a beautiful and highly cultivated plain. It is surrounded with walls, is well built, and is in the form of a square, divided by four great streets, which meet in the centre. The streets of F., though in general narrow, contain good buildings, among which the chief are an imposing cathedral, a fine market-place, surrounded with arcades and adorned with a fountain, and numerous palaces and ecclesiastical edifices. It is the seat of considerable manufactures of glazed and coloured earthenware vessels, which in Italy are called 'Majolica,' and in France 'Faience' (q. v.). Linen has a high place in the products of the town. Pop. 20,329.

F., the ancient *Faventia*, was at one period a town of the Boii, was afterwards a *municipium* under the Romans, and was annexed to the States of the Church in the 15th c. by Pope Alexander VI., in which condition it remained till 1860, when, with the Emilian provinces, it was annexed to the kingdom of Italy under Victor Emmanuel.

FA'GGING is the name given to a usage peculiar to the great public schools of England, the nature of which will be presently described. The origin of the practice cannot be traced. No school statutes refer to it, no school traditions speak of a time when it was not. The statutes of Eton College rather indicate precautions against it, for they ordain that there be thirteen poor youths in the establishment to work for the college; but in Edward IV.'s time the college was much impoverished by royal depredations—the fellowships were cut down from ten to seven, and these *pauperes juniores* abolished. However, be the origin what it may, the institution, as we have said, exists, and in very nearly the same form, in all the public schools—that is to say, Eton, Harrow, Westminster, Winchester, and Rugby. Its main features are in every case much as follows: In each school there are two limits: the upper limit, extending to the bottom of the first one or two forms (the public school designation of classes), below which a boy may not fag; and the lower limit, comprising the last four or five of the lowest forms, above which a boy may not be fagged. The boys between these limits, as also those who, although comprised within the lower limit, have been more than a certain time in the school, are devoid alike of rights and duties in connection with this practice. The services of a fag are of two kinds—the one comprising his duties to a special master, to whom he has been assigned; the other consisting of those due to the whole of the upper boys. The former comprise such tasks as preparing his master's breakfast, stoking his master's fire, carrying his master's messages, and smuggling into the house little forbidden delicacies for his master's consumption, and in this instance, if detected, bearing his master's punishment. Those services which a lower boy owes to the whole of the upper boys, consist of attendance at the games. In the cricket season, the fags perform the functions of a net, and stand behind the wickets to stop the balls while their seniors are practising; and at all seasons they are liable to the drearier task of waiting attendance on the racket-players, and retrieving the balls which have been 'skyed' out of the court. All cases of difficulty arising out of fagging are within the jurisdiction of the head-boy in the house, or the head of the school, and are settled by reference to him. Such are the main features of fagging at the present day—the idea pervading the institution being, that no boy should be liable to the performance of any duties really menial, but only such as, in the absence of the practice, would naturally be performed by each boy for himself. Many of the abuses of this practice, which have from time to time been discovered and suppressed, afford whimsical illustrations of the peccant ingenuity of boy-nature. In one school, a senior boy once had a study, but was not studious; he might have let it out to a younger boy in want of a crib to read in at a rent of some five or ten shillings a term, but his mind soared beyond such paltry dealings; he conceived vaster and grander ideas of the management of his property: he set up a tap. He smuggled into his room a nine-gallon cask, called a 'governor.' There was a rapid succession of governors, and a brisk demand for beer; so he appointed his fag, a fine stout lad, as deputy-tapster to receive the coppers. The deputy grew attached to both his governors, and flourished long and happily in the faithful discharge of his duties. Another instance consisted of an equally whimsical and widely different exercise of power. A sixth-form boy, of High Church principles, made his fags, two very nice well-conditioned young scholars, get up early and come to his room every morning before school for prayers.

So prominent a feature in the constitution of English public schools as the institution of fagging, has, of course, received much criticism from educational reformers. The well-known author of the letters from Paterfamilias to the *Cornhill Magazine*, himself an Etonian, and one of those rare instances of a public-school man dissatisfied with the recollections of his school-life, speaks of the practice with the greatest bitterness. 'Fagging,' says he, 'now happily almost obsolete, was also based upon the breeches-pocket question. I used often to doubt, when called off from my studies, whilst a lower boy at Harchester, to mend my master's fire, to prepare his meals, or to brush his clothes, whether a system which permitted and upheld such practices could really be beneficial to him or to me; but I never had any doubt that it was very beneficial to our tutor, inasmuch as it spared him the wages of some two or three servants, whose menial work was performed by the lower boys. Of course, the ingenuity of our masters discovered plenty of excellent arguments in support of practices so convenient to themselves; our parents used to be told that carrying coals for the upper boys, and toasting their muffins, made us helpful and docile, and took the nonsense out of bumptious lads; but such arguments would have applied just as aptly towards establishing the propriety of setting young noblemen and gentlemen to assist the scullion, or to sort out the dirty linen for the wash.' These are certainly sharp words, but doubtless many persons may be found to sympathise with a great deal of the censure contained in them. They will tell us that much vigilance is necessary to prevent the abuse of the power of exacting casual service on the part of the senior boys, and that the rules of fagging, such as they are, give no adequate security against serious vexation and waste of a small boy's time. They say that the favourite apology, on the ground of its taking the conceit out of those who have been spoiled at home, is fallacious; that football and parsing are sufficient curatives of this evil tone of mind; and that if the necessity to render service to a senior takes the conceit out, the subsequent privilege of the early exercise of power only too rapidly pours it in again. They deny, also, the validity of one very favourite assertion of the upholders of the system, that the relation between master and fag often, and indeed generally, gives rise to very pleasant intimacies between the upper and lower boys, and intimacies very beneficial to the latter. On the contrary, they maintain that no case of attachment between master and fag can be pointed to which would not have existed under any circumstances, and that this relation may often be found to have marred what would otherwise have been a very friendly recollection. The advocates of the system tell us, on the other hand, that the attendant evils are greatly exaggerated, and in some cases purely fictitious, while it is in many respects of very great, if not essential, service to the existence of a public school. They deny that it has been originated and upheld by the tutors from purely commercial considerations, as asserted by Paterfamilias; for, as has been already said, no really menial services are exacted of any boy, but only such as each boy might reasonably be expected to perform for himself, inasmuch as, in point of fact, many men at the university—not choosing or not being able to afford a gyp—do really prepare their own breakfast, stoke their own fires, and go on their own errands. That while abuses do occasionally occur, everything is against the probability of their frequency or extent, as the utmost facility exists on the part of the juniors for bringing their grievances before the proper authorities, and obtaining speedy redress. They say that, as a fact, the services of a fag are so light that he does not care or think about them, and they appeal in support of this statement to the tone in which the boys themselves are in the habit of referring to the subject. See the *Etonian*, a periodical published by some Eton boys 30 or 40 years ago; and the *Triumvirate*, a similar and more modern periodical from Harrow School. But the principal argument in the defence of the system must always rest, its supporters tell us, upon the security afforded by it against bullying. In public schools, where the ages of the boys vary from ten to twenty, a much greater liberty is given to the boys, and much greater confidence is reposed in them, than in private schools—the idea being, that their characters can only be truly formed by as unrestricted intercourse as possible among themselves, not hampered by the constant presence of a superior. This constant presence of a master is, therefore, replaced by the traditions and constitution of the school, in which each boy has his assigned position, and his definite rights and duties; a constitution, therefore, which each boy feels a personal interest in upholding. Such a society necessarily requires a provision for the relation between older and younger boys, between the weaker and the stronger; for, in the absence of this, the ordinary aspects of barbarism would be presented, and brute force be alone predominant. Such a provision, acceptable and intelligible to the boys, and reasonable in itself, is believed to be found in the fagging system. By this system, it is affirmed, provision is made alike for the claims of age and intellect, inasmuch as it is scarcely possible that any very stupid boy should fag, while no very old boy ever can be fagged.

These are the chief features of the fagging system at public schools, and the principal arguments by which it is supported and condemned.

FA'HRENHEIT, Gabriel Daniel, the improver of the thermometer, was born at Danzig about the end of the 17th c., and was originally designed for the commercial profession. His inclination for natural philosophy induced him to quit that business, and having travelled through Germany and England for the purpose of enlarging his knowledge, he settled in Holland. In 1720, he first conceived the idea of using quicksilver instead of spirits of wine in the construction of thermometers, by means of which the accuracy of the instrument was very much improved. See Thermometer. In 1724, F. was elected a Fellow of the Royal Society of London; and the *Philosophical Transactions* of that year contain several papers by him on points in natural philosophy. He died in 1740.

FAIENCE, or **FAYENCE**, a general term for all sorts of glazed earthenware and porcelain. The origin of the name is disputed. Some derive it from Fayence, a small town of Provence, others from Faenza, a city of Italy; while certain writers consider that the isle of Majorca is at least the place where it was originally manufactured, in proof of which they appeal to the fact, that the Italians still call Faience *Majolica* or *Mayolina*.

FAI-FO, a seaport of Anam (q. v.), is one of the more considerable marts of the empire. It stands on a river near its mouth, communicating with Turon, 15 miles to the north, by means of a canal. It exports sugar and cinnamon, its principal trade being with China. It contains 15,000 inhabitants, who are mostly Buddhists.

FAINÉANTS ROIS (the 'Do-nothing Kings'), the sarcastic designation of the later Merovingian sovereigns of France, under whose name the famous Mayors of the Palace really governed the country. The first of the Do-nothing Kings was Thierry III., nominally monarch of Burgundy, Neustria, and Austrasia; the others were Clovis III., Childebert III., Dagobert III., Chilpéric II., Thierry IV., and Childéric III. The last of these was dethroned in 730 A. D., and he being shut up in a monastery, Pepin *le Bref*, Mayor of the Palace, caused himself to be formally proclaimed king. This was the end of the Merovingian dynasty; it is curious that Louis V., the last of the Carlovingians, and a descendant of Pepin *le Bref*, also received the contemptuous epithet of *Fainéant*, as those monarchs had who were dethroned by his ancestors.

FAI'NTING, or **SY'NCOPE** (Gr. *syn*, and *koptō*, I fall down), is a condition in which, from a sudden mental or bodily impression, the circulation of blood is temporarily arrested or very much diminished in force and volume, the respiration and the functions of the nervous system being likewise suspended. The indications of fainting to a bystander are chiefly a sudden pallor, accompanied by loss of power over the limbs, with disappearance of the pulse and movements of respiration; the eyes are commonly half open or closed, the countenance bloodless, but quite at rest, and not indicative of suffering or disturbance: the flaccid, motionless condition of all the limbs also tends to distinguish simple fainting from epilepsy, and the other diseases attended with spasm; whilst the vanishing of the colour, and the suppression of the pulse, make a marked distinction between fainting and Catalepsy (q. v.), and other forms of Hysteria (q. v.); with which disorders, however, fainting may in some cases be associated. The mode of origin of fainting, and the study of its phenomena, alike lead to the conclusion that it is primarily an impression upon the nervous system, very much of the same nature as the Collapse, or shock of a severe bodily injury; this reacts, in the first instance, on the heart, and through the circulation on all the other functions of the body. Fainting may end in death, if too prolonged, or if associated with disease of the internal organs, and especially of the heart; hence a particular variety of fainting has been separately studied, and named *Syncope anginosa*, or otherwise *Angina pectoris*. See Heart, Disease of. Ordinarily, a person who faints from mental emotion, a hot and close atmosphere, or other transient cause, is readily restored by being laid on the back with the head low, and surrounded by abundance of cool fresh air. Any tight articles of dress should be loosened, and a stream of cold air, or a little cold water, should be directed to the face and neck, so as to rouse the respiratory movements. It is common, also, to apply ammonia or aromatic vinegar to the nostrils; but a more effective way of exciting the respiration is to compress the ribs, and allow them to expand again alternately, so as to imitate the natural movement. Care should be taken to ascertain that there is no obstruction in the throat or air-passages, as suffocation from mechanical causes has been mistaken for fainting, and the real origin of the mischief overlooked, with fatal consequences. Should all other means fail, Galvanism (q. v.) will sometimes succeed in restoring the respiration and heart's action.

FAIOUM. See Fayum.

FAIR. See Fairs.

FAIR or **BENMORE HEAD**, a promontory of the north coast of Antrim, Ireland, opposite Rathlin Isle, which is four miles to the north-west. It rises 636 feet above the sea. The lower 300 feet consists of carboniferous strata, overlaid by greenstone columns, 20 to 30 feet thick, and rising 280 to 300 feet high. It is perpendicular to the sea, but slopes to the land. The table-land on the top is covered with rich pasture, and presents fine views of the neighbouring coast, Rathlin Isle, and the Argyleshire Highlands, 16 miles distant. On the promontory are two small lochs, 500 feet above the sea.

FAIR ISLE, a solitary isle in the Atlantic, 25 miles south-south-west of Fitful Head, in the south of Shetland. It is 4 by 2½ miles in extent, and rises 708 feet above the sea, with high rocky cliffs and promontories, one of which, the Sheep Craig, rises 480 feet. The isle is accessible for ships only at one point on the south-east. It affords copper ores, and hand-shaped sponges called 'trowie gloves.' Pop. about 300, chiefly fishers. At Stromceiler Creek, was wrecked, in 1588, the Duke of Medina Sidonia, admiral of the Spanish Armada. He escaped, after most of his crew were murdered.

FAIRBAIRN, William, LL.D., was born at Kelso, in Roxburghshire, in 1789. Having learned a little reading, writing, and arithmetic at the parish school of Mullochy, in Ross-shire, and afterwards got some six months' instruction from an uncle, he was apprenticed to an engine-wright at Percymain Colliery, North Shields. When his apprenticeship terminated, F. wrought for two years in London, and then visited many places in England, Wales, and Ireland, working a short time at each, in order to observe the various practices of different localities. Eventually, he commenced business on his own account in Manchester in 1817. It was a struggle in which, without money or connections, only great abilities and perseverance would have succeeded. The first great improvement introduced by F. was the substitution of iron for wood in the shafting of cotton-mills, and the substitution of light for heavy shafting where metal was already in use. This exchange economised the cost of machinery, and enabled the motion to be speeded from 40 to 160 revolutions per minute. F. was amongst the earliest of the iron ship-builders, and has originated various improvements in their construction. The firm has built more than a hundred vessels, varying from the smallest size up to the war-frigate of 2600 tons.

In 1834—1835, F. and Mr E. Hodgkinson were invited by the British Association for Advancement of Science to seek out the cause of certain supposed defects in the iron produced by hot-blast furnaces, and a very interesting report thereon appears in the *Transactions* of the Association. Nearly at the same time, F. tested the strength of the various kinds of iron of Great Britain, the report of which appears in the *Transactions* of the Philosophical Society of Manchester, and contains much useful information for engineers. Another report, published in the *Transactions* of the Royal Society, gives the tenacity of boiler-plates of various thicknesses, and determines the best mode of riveting. He also made a long series of experiments on the resistance of hollow tubes or cylinders to collapse from outward pressure, leading to valuable practical results.

The first idea of a tubular bridge across the Menai Strait is due to Robert Stephenson, but its realisation is due to F. more than to all other men. Stephenson's idea was a circular tube, supported by chains; but the Britannia and Conway bridges are rectangular structures, strengthened by a series of cells at the top and bottom, and without chains or any other support from pier to pier. The present form results from a long series of experiments upon model tubes—circular, egg-shaped, and rectangular, which were conducted entirely for a long time by F., and latterly, with the aid of Mr E. Hodgkinson, as a mathematician, to deduce a law from the tabulated results of experiments. F. has erected more than a hundred bridges upon this principle. See Tubular Bridge. F. is a Fellow of the Royal Society; Corresponding Member of the Institute of France; LL.D. of Edinburgh; and was President of the British Association for the Advancement of Science, 1861—1862. His son Thomas was chairman of the Art Treasures Exhibition at Manchester, 1857, and is a Commissioner for the Exhibition 1862. Father and son have each declined the honour of knighthood. F. has published the following works: *On Canal Steam-navigation; The Strength and other Properties of Hot and Cold Blast Iron; The Strength of Iron at Different Temperatures; The Strength of Locomotive Boilers; The Effect of Repeated Meltings on the Strength of Cast Iron; The Irons of Great Britain; The Cohesive Strength of Different Qualities of Iron and Stone; The Strength of Iron Plates and Riveted Joints; The Conway and Britannia Tubular Bridges; The Application of Iron to Building Purposes; The Strength of Hollow Globes and Cylinders, when Exposed to Pressure from Without; Useful Information for Engineers*, 1st and 2d series; *A Treatise on Mills and Millwork;* and several other papers published in the *Transactions* of the Royal Society and of other institutions.

FAIRFAX, Edward, the translator of Tasso's *Jerusalem Delivered*, was a natural son of Sir Thomas Fairfax of Denton, in Yorkshire. The year of his birth is not known. He spent his life at Fuystone, in the forest of Knaresborough, in the enjoyment of many blessings which rarely befall poets—competence, ease, rural scenes, and an ample command of the means of study. F. was alive in 1631, but he is supposed to have died shortly after. His celebrated translation of Tasso was made in the reign of Queen Elizabeth, to whom it is dedicated. The first edition bears the date of 1600. For poetical beauty and freedom, it has been the theme of universal praise. Dryden ranked F. with Spenser as a master of English, and Waller said that he derived from him the harmony of his numbers. F. also wrote a treatise on *Demonology*, in which he was a believer—a credulity which was probably of no little use to him in the translation of a work full of the machinery of enchantment. Hence Collins says regarding him—

> Prevailing poet, whose undoubting mind
> Believed the magic wonders which he sung.

This treatise is still in manuscript.

FAIRFAX, Thomas, Lord, general of the parliamentary troops in England during the civil wars under Charles I., was the son of Ferdinand, Lord Fairfax, and was born in 1611, at Denton, in Yorkshire. He studied at St John's College, Cambridge, and afterwards served as a volunteer in Holland, under Lord Vere, whose fourth daughter, Anne, he married shortly after his return to England. On the outbreak of the civil war in 1642, F. warmly espoused the cause of the parliament, and was appointed cavalry-general under his father, who commanded the parliamentary forces in the north. He distinguished himself so much by his valour, prudence, and energy, that in 1645, when the Earl of Essex resigned his office of general of the parliamentary forces, F. was appointed in his room. In a short time, Cromwell, who had been appointed lieutenant-general, obtained unbounded influence over him; and from this time, although nominally head of the parliamentary forces, he really played a secondary part. At last, in June 1650, he refused to march against the Scots, who had proclaimed Charles II. king, and Cromwell was appointed commander-in-chief in his stead. F. now withdrew into private life, and did not come forward again until after the death of Cromwell, when he shewed a zeal for the restoration of the king, gathered troops for that purpose to assist General Monk against Lambert; and was appointed one of the delegates despatched to the Hague in 1660 to promote the return of Charles II. He died at Bilburgh, near York, 12th February 1671. F. had a slight turn for literary pursuits, and wrote several works, prose and poetic; among others, one entitled *Short Memorials*, which was published in 1699.

FAI'RIES, ELVES (Ger. *elbe*, or *elfe;* Sw. *elf;* Dan. *ellefolk;* Old Norse, *alfr;* all allied apparently to Lat. *alb*(us), white, and signifying a bright, benign spirit; Fr. *fée;* Ital. *fata*), supernatural beings, generally of diminutive size, a belief in whom has been among the superstitions of the greater portion of the European nations. The etymology of the word *fairy* is doubtful; some derive it and the Fr. *fée* from a Celtic word *'faer*, to charm or bewitch; others associate the Fr. *fée* and the Ital. *fata* (a friendly goddess or spirit) with Lat. *fatum*, fate; others, again, trace *fairy* to the *peri* of the Persians (pronounced *feri* by the Arabians), holding it to have been brought to Europe by the Crusaders. Be this as it may, the Celtic fees or fairies are undoubtedly relics of those *matres* and *matronæ*, which appear on Gallo-Roman inscriptions as objects of popular belief. After the transfusion of the Teutonic and southern nations, the northern elves (which were originally of two kinds—the light elves, or elves proper, and the dark elves, or dwarfs) became mixed up with their Celtic kindred the fairies in inextricable confusion.

It is generally difficult to give any scientific definition of the nature of a superstition, because its phenomena are continually varying according to time, place, and other conditions. The fairy superstition especially defies definition, because it was the peculiarity of the creatures to whom it referred that they followed no regular law, human or divine, but obeyed the impulse of their own caprice; hence every fairy tale differs from another. Still, there are distinctions and specialities that can be made out from the examination of a large number of these narratives. In the first place, the superstition peculiarly belongs to modern Europe. We find nothing like it among the idolatries of the heathen referred to in Scripture, nor does the word occur in the English Bible, or its equivalent in the original texts. In classical mythology, there is nothing nearer to it than the nymph of the fountain or grove among the Greeks. In the next place, it may be determined that the varieties in the superstition correspond, in some measure, with those of the physical geography of the districts in which it prevails. In those parts of the world where there are mountains, mists, dangerous morasses, cataracts, and stormy oceans, all superstitions, being a belief in supernatural agencies, are naturally exaggerated, and, from the dangers to which the people are liable from the agencies they deem supernatural, the belief takes deep root in their minds. Accordingly, in flat and well cultivated countries like England, the fairy superstition is simple and homely, connecting itself with matters of domestic routine, such as the sweeping of the dwelling-house, the skimming of the milk, the preservation of the butter, and the like; while in Scandinavia and the Highlands the fairy people are connected with storms and convulsions, betray people to their death, fly away with them into the infinite cloud-land, or lead them through endless caverns within the earth. It has been observed, as a further distinction, that the fairies of the German or Teutonic tribes are more harsh, fierce, uncomely, or deformed than those of the Celtic nations, which have a tendency rather to the aërial and the graceful. Still, there is so great an amount of common characteristic in the superstition throughout Europe, and its peculiarities have been found so much more emphatically displayed in Scandinavia than elsewhere, as to have suggested to some the view, that the superstition is a remnant of the old mythology of the northern nations, communicated by them to a greater or less extent in all the countries over which their vikings carried their ravages.

There is a further distinction—at least in this country—between the fairies of poetic and heroic literature and those of popular belief—the former being princes and princesses of chivalry, only distinguished from human beings by their superhuman superiority in all the qualities which elicited respect in the age of chivalry; while those of popular belief are small in stature, sometimes decrepit, and endowed with dispositions generally more allied to malignity than magnanimity. It is common to all classes of them to be deemed under the condemnation of the religion of the gospel, and to be either conditionally or unconditionally excluded from the abodes of the righteous in the next world. In Ireland and the Highlands, they have been spoken of as a wandering remnant of the fallen angels. It is sometimes a symptom of geniality and kindliness in a people when their fairies are supposed to be capable of earning their own redemption. Sometimes they are supposed to be human beings, metamorphosed or disembodied, and this form of the superstition has made fairyland a place of purgation for those whose sins have condemned them to it. The analogy is carried out in the belief that the services of the living can extricate the souls so situated; but it is rather through dexterity and courage than pure piety that the feat is achieved, and the rescues from fairyland form some of the most wild and exciting of the elfin narratives—as, for instance, the strange, wild ballad of *Tamlane*.

There is still another broad distinction into those that dwell in the upper air and those that dwell within the bowels of the earth, while a third class frequent the waters. The surface of the earth on which mankind reside is not deemed the proper place of any class except on special occasions. The Scandinavians called the fairy inhabitants of the air white elves; those of the earth, black. Whatever was genial, light, playful, and benevolent in the superstition, clustered round the former; the latter did all the work that was dark, cruel, and rapacious. Naturally enough, the black or subterranean kind frequented mining districts, where they might be seen extracting the ore for themselves, and thus unwittingly leading the miner to rich veins of metal. They might be seen in an occasional peep through an aperture of a hill in their underground retreats, in chambers supported on jasper columns, where they were stowing away their hampers of gold and silver—for they were generally held to be very affluent. Some of the most exciting tales about the German gnome, and the Irish leprechaun, who was a creature of the same kind, are founded on the efforts of adventurous mortals to get possession of their riches. There exists a legend, occurring in nearly identical terms in several countries, which connects some piece of valuable plate belonging to a church with the underground fairies. The story of the horn of Oldenburg is a type of these narratives. The pictures of it represent it as a beautiful drinking vessel, in the shape of a horn, exquisitely decorated with the finest fanciful silver-work, in the style contemporary with the richest Gothic architecture. The legend is, that one day, Otho of Oldenburg, being exhausted with hunting, and very thirsty, exclaimed: 'O God, would that I had a cool drink!' Thereupon there appeared before him, as if coming out of the rock, a lovely maiden, who offered him a drink in the fairy horn. He made off with it, and saved himself from evil consequences by bestowing it on the church. Hence these relics are generally in churches; but one of them is, or lately was, in the possession of an English family, and as their prosperity was traditionally believed to depend on retaining it, it was called 'The Luck of Eden Hall.'

Puck and the pixies belong to the same class of beings. Of the ell-folks of Scandinavia, the male is old and ill-favoured, but the evil element in the ell-woman or ell-maid consists in her beauty, which enables her to be very dangerous to foolish young gentlemen, whom she waylays either by her own proper charms, or by personating the objects of their affections.

In Ireland, and also in the border country of Scotland, the fairy superstition has been the theme of innumerable poetic legends and mystic traditions. T. Crofton Croker, in his *Fairy Legends and Traditions of the South of Ireland*, 3 vols. 1828, presents a full and amusing account of the Irish fairies or elves, which he describes as 'a few inches high, airy, and almost transparent in body; so delicate in their form that a dew-drop, when they chance to dance on it, trembles indeed, but never breaks. Both sexes are of extraordinary beauty, and mortal beings cannot be compared with them.' They do not live alone, or in pairs, but always in large societies, and are governed by a queen. The same author adds: 'They are invisible to man, particularly in the day-time, and as they can be present and hear what is said, the peasantry never speak of them but with caution and respect, terming them the good people, or friends. They have their dwellings in clefts of rocks, caves, and ancient tumuli. Every part within is decorated in the most splendid and magnificent manner; and the pleasing music which sometimes issues from thence in the night, has delighted those who have been so fortunate as hear it.' There are Irish fairies, however, of more special character. Among these are the Banshee, or female spirit who watches a particular family; the Cluricaune, an elf of evil disposition, who usually appears as a wrinkled old man, and has a knowledge of hidden treasure; and the Phooka, a spirit of diabolical disposition, who sometimes appearing as an eagle or a black horse, hurries the person he gets possession of to destruction. Of similar varieties are the Scottish elves: the Brownie, or domestic spirit nearly corresponding to the Banshee; the Kelpy, a kind of water-horse, being little different from the Phooka; and the Cluricaune being as regards figure somewhat analogous to the being sung by Leyden in his charming ballad, 'The Court of Keeldar' (*Minstrelsy of the Scottish Border*):

> 'Brown dwarf, that o'er the muirland strays,
> Thy name to Keeldar tell!'
> 'The Brown Man of the muirs, who stays
> Beneath the heather-bell.'

According to Irish as well as Scottish fairy superstition, the elves, though in the main harmless, or at most tricky, have the bad reputation of stealing away young children from the cradle, and substituting for them a changeling who bears a resemblance to the stolen infant, but is an ugly little creature, and never thrives. On this theft of a female infant, who is carried to Fairyland, but in the course of years returns to her parents, James Hogg founded his fine ballad of 'Kilmeny' (*Queen's Wake*). It need hardly be added, that in the progress of general intelligence, the fairy superstition has disappeared in Scotland as well as in the greater part of Ireland, and now is as little a matter of credence as is the belief in England of that useful drudging fiend, Robin Goodfellow. Besides being embalmed in imaginative literature, the fairy has a perpetual memorial in the small exquisitely shaped arrow-heads found so abundantly in northern countries, where they were long known as elf-arrows, or bolts with which the more malignant fairies sometimes slew or injured cattle and human beings; thus, when a poor man's cow or heifer was suddenly affected with some deadly and incomprehensible illness, it was said to be 'elf-shot.' See ELF-ARROW-HEADS.

For the most comprehensive account in the English language of the various shapes assumed by this superstition, the reader is referred to *The Fairy Mythology*, by Thomas Keightley.

FAIRS (Fr. *foire*, from Lat. *forum*, a market place, or *feriæ*, holidays), great periodical markets, some of which are chiefly devoted to one kind of merchandise, while others, of a wider scope, afford opportunity for most of the sales and purchases of a district. Fairs have long been regularly held in most parts of Europe, and in many parts of Asia; but as they belong rather to a state of things which is passing away, than to modern civilisation, they have not been established or have not acquired the same importance in America. In Europe, they appear to have originated in the church festivals, which were found to afford convenient opportunities for commercial transactions, the concourse of people being such as took place upon no other occasion. This origin of fairs is commemorated in their German name *Messen*, which is derived from the word employed to denote the most solemn part of the church service. See MASS. Some festivals, from circumstances of place and season, speedily acquired a much greater commercial importance than others, and began, therefore, to be frequented by buyers and sellers even from remote parts of the world. When the ordinary means of communication between countries and of the exchange of commodities were very limited, fairs were of great use. Princes and the magistrates of free cities found it to their advantage to encourage them, and many privileges were granted to them, which in some places still subsist. Courts of summary jurisdiction—commonly called *pié poudre*, from the dusty feet of the suitors—were established distinct from the ordinary courts of the county or city, for the determination of questions which might arise during the fair. In connection with all this, the practice was necessarily adopted of publicly proclaiming the commencement and duration of the fair, and this still subsists where scarcely any other vestige remains of the old privileges of fairs, and where they have ceased to be of any real use to the community, and might, perhaps, with advantage to all the interests of society, be now abolished, as in the case of some of the annual fairs still held in the great cities of Britain.

In Western Europe, the goods exposed for sale at fairs are chiefly those in respect of which there is a frequent change of fashion. Provisions are seldom an article of merchandise in them; and while in some parts of the continent persons of all ranks still wait for the great yearly fairs to make their principal purchases of clothing and of manufactured articles of every description—such things as corn, wine, spirits, tea, coffee, sugar, tobacco, oil, &c., are seldom seen in them. It is otherwise, however, in places on the outskirts of civilisation; and almost all the produce of great provinces is sold, and all that their inhabitants require is bought at such fairs as those of Kiachta and Nishnij-Novgorod. The British fairs really of much use at the present day are chiefly those at which cattle are exposed for sale: of these some held on the borders of the Scottish Highlands, and elsewhere in Scotland, are frequented by buyers and sellers from all parts of the kingdom, and bring together the breeders of cattle and the graziers, by whom the animals are to be fed for the butcher. Such are the fairs or trysts, as they are called, at Falkirk, Doune, Edinburgh, &c. At other great yearly fairs in the south of Scotland, lambs and wool are sold; and fairs chiefly for the sale of the annual produce of pastoral districts are common in almost all parts of the world.

The greatest fairs in the world are the Easter and

Michaelmas fairs at Leipsic. These are not to be confounded with the Leipsic Book-fair, which is chiefly an occasion for the settlement of accounts among booksellers and publishers. Next to the Leipsic fairs, those of Frankfurt-on-the-Maine are the most important in Germany. The fairs of Frankfurt-on-the-Oder, and of Brunswick in Germany, of Zurzach in Switzerland, Pesth in Hungary, Sinigaglia in Italy, Bergamo in Lombardy, Beaucaire and Lyon in France, and Nishnij-Novgorod in Russia, are among the most important in Europe. After the great fairs of Leipsic, that called the Fair of St Peter and St Paul at Nishnij-Novgorod is the greatest in the world, and is frequented by buyers and sellers from different parts of Europe, and of Northern and Central Asia. The fairs of Tanta in Upper Egypt, of Kiachta in the south of Siberia, of Irbit, also in Siberia, of Mecca in Arabia, and of Hurdwar in Western India, are also of very great importance, and are the most considerable fairs out of Europe. That of Kiachta is a sort of barter-market, where almost all the commercial transactions between the Russian and Chinese empires take place. The fairs in Britain have latterly sunk for the most part to insignificance, and in many instances have entirely disappeared. They were gatherings adapted to a comparatively backward state of society, when the provincial stores of goods were few, and the means of communication defective. The prevalence of good roads, populous towns with dealers in miscellaneous wares, and other tokens of advancement, have superseded the necessity for the ordinary class of fairs, and in consequence they have in some cases degenerated into scenes of merriment, such was Bartholomew Fair, London, now extinct; also Greenwich Fair, Glasgow Fair, and Donnybrook Fair, near Dublin; this last being likewise either extinct, or nearly so. The boisterous merriments at these fairs were of old the devices employed as likely to attract a great concourse of people; hence each fair had its sport or drollery—football, wrestling, yawning, cudgel-playing, throwing at cocks, sack-races, flying dragons, grinning through horse-collars, mock-giants, monstrous fishes, soaped pigs, smoking-matches, eating hot hasty-pudding, whistling, wheelbarrow races. M. Bottin, the author of a statistical *View of the Fairs of France*, says that on examining his work it will appear that they were placed for the most part on the frontiers of the kingdom, or on the marches of ancient provinces; or at the foot of high mountains, at the beginning or end of the snow-season, which for months shuts up the inhabitants in their valleys; or in the neighbourhood of famous cathedrals or churches frequented by flocks of pilgrims; or in the middle of rich pastures. A fair in the north of Scotland, held in June, when the nights are very short, began at sunset, and ended an hour after sunrise: it was called 'Sleepy Market.'

FAIRY RINGS are spots or circles in pastures, which are either more bare than the rest of the field, or more green and luxuriant. Frequently a bare ring appears, like a footpath, with green grass in the centre, and the circle which the ring forms, or of which it might form a part, is often some yards in diameter. These rings began to attract the attention of men of science in the latter part of the last century, and various hypotheses were suggested to account for them. Some imagined that they might be the effect of lightning. Dr Withering appears to have been the first to ascribe them to the growth of mushrooms. Dr Wollaston further investigated the subject, which has more recently been very fully investigated by Professor Way; and it is now perfectly ascertained and universally admitted, that fairy rings result from the centrifugal development of certain kinds of fungi, especially of *Agaricus oreades*, *A. gambosus*, *A. coccineus*, and *A. personatus*. The Common Mushroom (*A. campestris*) shews a tendency to grow in the same manner. Probably the spot where the agaric has already grown is unfitted for its continued nourishment, and the *mycelium* (spawn) extends outwards to new soil, the fungus unfitting the soil to which it extends for the immediate nourishment of grass, but enriching it afterwards by its own decay. The *mycelium* of many fungi has certainly a tendency to extend outwards from a centre; and decayed fungi, containing not a little of the phosphate of potash, are a highly stimulant manure for grasses. Fairy rings of large size sometimes occupy the same situation for many years. The circle is almost always imperfect, some accidental circumstance having arrested the growth of the mycelium on one side.

FAITH is used by theologians in various senses. It is sometimes taken to denote the mere assent of the understanding to a set of facts or of propositions set before it; it is more peculiarly used to express the living reception by the heart of the 'truth as it is in Christ.' Some divines have enumerated no fewer than four kinds of faith: 1. The faith of miracles, or that immediate persuasion of the Almighty presence and power of their Master, which enabled the early Christians to work miracles—a persuasion, apparently, which might exist and issue in astonishing results without being associated with moral excellence. 'Though I have all faith,' says St Paul, 'so that I could remove mountains, and have not charity, I am nothing.' 2. Historical faith, or the assent of the understanding to truth the evidence of which is irresistible, such as we have described above. 3. Partial or temporary faith, such as our Lord implies in his exposition of the parable of the Sower, and as appeared to animate those who, after having followed after Christ, turned back and walked no more with him; and 4. Saving faith, or the persuasion of Christian truth wrought in the heart by the Holy Spirit.

These distinctions are rather theological refinements than anything else; the proper and characteristic meaning of the term faith in Scripture has little to do with any of them except the last. 'Faith,' says the writer of the Epistle to the Hebrews, 'is the substance of things hoped for, the evidence of things not seen.' It is a vision, quality, or capacity of soul whereby spiritual truth is apprehended, and spiritual life engendered. The distant is brought near by it, and substantially appropriated; the unseen is felt to be a reality. Faith is the organ by which the soul passes beyond the present and the visible to the eternal and the invisible. Still more characteristically, perhaps, faith is the living affection which binds the Christian to Christ *as a Saviour*. 'Faith is a saving grace whereby we receive and rest upon Christ alone for salvation, as he is freely offered to us in the gospel.' This is its highest and most comprehensive meaning, out of which all the others come. 'What shall I do to be saved?' asked the Philippian jailer of Paul. 'Believe on the Lord Jesus Christ,' he replied, 'and thou shalt be saved.' And it is remarkable how frequently it is Christ or God—a living person—rather than any mere truth or series of truths which is represented as the proper object of Christian faith. 'Ye believe in God; believe also in me.' 'We believe in him that raised up Jesus our Lord from the dead.' 'Abraham believed God, and it was accounted to him for righteousness.' 'Come unto *me* all ye that labour and are heavy laden, and I will give you rest.'

Faith, therefore, in this its highest view, is nothing but trust in God and in Christ. This is the faith which 'worketh by love,' and 'overcometh the world'—the faith of which St Paul and St John alike speak. The faith mentioned by St James in apparent conflict with works is different; it seems to have been a mere religious distinction. 'Thou hast faith, and I have works.' One party put forth faith as their religious badge—another works. The spiritual or true meaning of either the one or the other was little regarded.

Faith, in the distinctively Christian sense, can only exist by the operation of God's Holy Spirit. 'For by grace are ye saved, through faith; and that not of yourselves; it is the gift of God.' Orthodox divines greatly insist on the necessity of this operation of the Spirit of God, yet not so as to exclude the active co-operation of man. The Pelagian and Antinomian extremes respectively throw out —the former the divine, the latter the human element. Orthodoxy combines the two, attributing to God the effective agency, but to man a real and voluntary concurrence. Some of the principal theological controversies connected with faith, and not here already mentioned, will be noticed under JUSTIFICATION.

FAITHORNE, WILLIAM, a very eminent English engraver, was born in London in the early part of the 17th c., but the exact date is not known. He was a pupil of Mr (afterwards Sir Robert) Peake, printer and printseller. On the outbreak of the civil war, he followed his master, who had taken up arms for King Charles. Both were taken prisoners at Basing-House. F. was sent to London, and imprisoned in Aldersgate, but after some time was released, and obtained permission to leave the country. He went to France, where he increased his proficiency in the art of engraving, and returning to England about 1650, commenced business as a printseller near Temple Bar. He also engraved steadily for the booksellers at the same time. About 1680, he gave up his shop, but still prosecuted his art, besides executing portraits in crayon, and painting in miniature. He died in May 1691. F.'s engravings are for the most part portraits. Walpole has given a pretty full list of them, a few of which we may mention, such as the portraits of 'Thomas Hobbes,' ætat 76; 'Henrietta Maria;' 'Cromwell;' 'Prince Rupert;' 'Sir Thomas Fairfax;' and 'John Milton,' ætat 62. At first F. imitated the Dutch and Flemish manner of engraving; but his residence in France appears to have considerably modified his earlier style. F. is also an author, having published in 1662 a treatise on engraving, dedicated to his old master, and entitled *The Art of Graveing and Etching, wherein is expressed the true Way of Graveing in Copper. Also the Manner and Method of that famous Callot and M. Borse in their several Ways of Etching.*

FAKI'R, a word derived from the Arabic *fakhar* (poor), and designating a member of an order of mendicants or penitents, chiefly in India and the neighbouring countries. In Persia and Turkey, the word is also used for Moslem priests and dervishes (see DERVISH). The origin of Fakirism, an institution which reaches back to the most remote antiquity, is lost in mythical darkness. The common account of the son of a mighty rajah, who, expelled from his home and country by the cruelty of his father, made a vow, half in revenge, and half in contrition, henceforth to roam a beggar through the world, and to win proselytes to a life of poverty and self-mortification, as the one most befitting in man, and most pleasing to the Deity, can hardly be called historical. The same yearning for rest, for peace, and pious contemplation, for escape from the noise and turbulence of the world, which has everywhere and always led still and pensive minds into seclusion and solitude, must naturally have been more powerful here, in a land which yielded almost of itself, and in abundance, all that was necessary for the sustenance of man—in a climate of flower and sunshine, where a hermit's calm retreat might well rise before the wearied eye in all the soft sunset hues which surround the abode of the recluse in the Ramayana, or in the Sakoontala. But constant seclusion and ceaseless meditation here, as elsewhere, produced in all but exceptional minds their sad results. Piety is no longer enough; sanctity is the goal. Thus, abstinence becomes mortification and self-torture; mental repose, mystic self-absorption, or frenzied exaltation. This leaning of the Hindus to a life of asceticism was fostered by their primeval religion, which enjoins various exercises of penance and mortification upon the three higher castes in general, but upon the Brahmins in particular. These, having passed through different stages of regeneration, end by becoming Sanyassis ('who have left everything'), and are dead to the law. The world and its usages have no more any claim upon them; even religious ceremonies are no longer necessary to the 'United with God.' They go naked, or in filthy rags, receive the meanest food only, and that without either demand or thanks. Their ethical code consists in the observance of truth, chastity, internal purity, constant repentance, and contemplation of Deity. After these models Fakirism seems chiefly to have been framed, and its adherents were not only pious men, but occasionally saints, workers of miracles, and healers of all ills, especially epilepsy and sterility. The halo which from the first surrounded Fakirism, and the ready worship offered by the people, attracted to its ranks, at a very early date, many whose motives were anything but pure, and who, under a garb of humility and mendicity, collected fabulous treasures. Strabo already distinguishes these vagabonds from the more honest members of their class, and if we may trust the travellers of our own day, the more respectable element has now altogether disappeared. Their number is variously stated. In the time of Tavernier's visit, there were more than 1,200,000 Hindu, and 800,000 Mohammedan fakirs in the East Indies, and their present number is said to exceed 3,000,000. Papi describes the Mohammedans as guilty of the greater follies. At times, especially in their return from distant pilgrimages, they are even dangerous, as the killing of an unbeliever is supposed to be an infallible introduction to the glories of paradise. They live either separately as hermits or solitary mendicants, or unite in large gangs, carrying arms and a banner, beating drums, and sounding horns as they approach a town or village. Their appearance is disgusting in the extreme; they go naked, besmeared with the dung of the holy animal, the cow. Some bedeck themselves with the skins of serpents, some with human bones; others array themselves in the garb of women. Their fearful shrieks, and the hideous rollings of their eyes, add to the disgust of their appearance. Imitating madmen, they generally end by becoming madmen. The height to which self-torture is frequently carried by these wretched fanatics, and of which we meet with signs even so far back as the Ramayana, where a penitent is described as perpetually sitting with upraised arms between four fires, the sun forming the fifth, is so appalling that human nature shrinks from the mere description. Some pass their whole lives in iron cages, laden with heavy chains; some clench their fists till their nails grow through the hand; others hold aloft both their arms till they become like withered branches; while others, again, tie their hands and feet together, and roll head over heels for thousands of miles. Not the least sad feature in all this is, that these religious antics are not confined to men, but that youths, and even children of tender age, are occasionally initiated therein.

FALAISE, a town of France, in the department of Calvados, is situated on a lofty platform bordering on a precipice, or *falaise*, whence its name. It is situated on the Anté, a feeder of the Dive, 22 miles south-south-east of Caen. It has three suburbs, one of them, Guibray, a mile to the east, rivals the town itself in size and population. The buildings of interest are the ecclesiastical edifices, the hospital, the public library, and, more than all, the old and ruined castle, once the seat of the dukes of Normandy, and the birthplace of William the Conqueror. In the castle, the chamber in which the Conqueror was born is still shewn, as well as a tower called 'Talbot's' Tower, which is supposed to have been built by Talbot when Lord Warden of the district, after the capture of F. by Henry V. of England. F. has manufactures of cottons, hosiery, and bobbin-net. At Guibray, an important annual fair is held, at which great numbers of horses and cattle are sold. It takes place between the 10th and 25th of August. Pop. 7960.

FALCHION. See SWORD.

FALCON (*Falco*), in the Linnæan zoology, a genus of birds, including all the diurnal birds of prey, now known as the family of *Falconidæ;* but in its present use as a generic name, limited to nearer accordance with its popular use, as a designation of those species which, in the language of falconry, were styled *noble birds of prey.* The true falcons are characterised by a bill curved from the base, the upper mandible hooked at the point, and the cutting edge of the upper mandible furnished with a strong projecting notch, or *tooth.* The claws are also sharp, curved, and strong; and in accordance with all this powerful armature, the whole frame is very robust and muscular. The legs are rather short, and have great power in striking or seizing prey. The keel of the sternum (breastbone) is very large, and adapted for the attachment of powerful muscles; the furcula and coracoid bones (see BIRDS) are also very strong, so as to afford a sufficient resisting base for very powerful action of the wings. The wings are long and pointed, the first and third quill-feathers of equal length, the second rather the longest, the first and second quill-feathers emarginated near the tip. The true falcons are bolder in proportion to their size than any other Falconidæ—even eagles. Their acuteness of vision is wonderful; and they have very great powers of flight. A F. is known to have traversed the distance between Fontainbleau and Malta, not less than 1350 miles, in 24 hours; and as these birds do not usually fly during the night, its flight was probably at the rate of 70 or 80 miles an hour. They soar to a prodigious height in the air, always endeavouring to outsoar any bird of which they may be in pursuit, and to swoop down upon it from above; although it is far more difficult for them to rise vertically in a calm atmosphere than for birds of short and rounded wing, and they either rise obliquely—often also making their onward flight in a series of arcs—or avail themselves of the wind, and by flying against it, are borne aloft as a boy's kite is. The species are pretty numerous; some of them are of very wide geographic distribution, whilst others are peculiar to certain countries or climates. The British species are the GYRFALCON (q. v.), or Jerfalcon (*F. Gyrfalco*), also known—although, perhaps, with difference of variety—as the Iceland F. and Greenland F.; the PEREGRINE F. (q. v.), (*F. peregrinus*), of which the female is *par excellence* the F. of falconers (see FALCONRY), and the male is the Tercel, Tiercel, or Tercelet; the HOBBY (q. v.), (*F. subbuteo*); the Red-footed F., or Red-legged F. (*F. rufipes*), a small species, much resembling the Hobby; the MERLIN (q. v.), (*F. æsalon*); and the KESTREL (q. v.), or Windhover (*F. tinnunculus*). For the species chiefly used in falconry see FALCONRY.

Very closely allied to the true falcons are the species constituting the genus *Hierax*, very small, but remarkable for strength and courage, natives of the East Indies. The upper mandible has two notches. In the *Harpagons* (*Harpagus* or *Bidens*) of South America, both mandibles have two notches. None of these, however, are equal to the true falcons in length of wing.

For particulars regarding the Falconidæ, as subservient to field-sports, see FALCONRY.

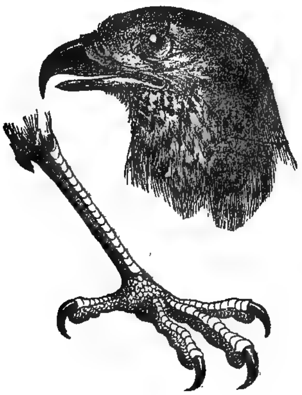
FALCO'NE, ANCILLO, an eminent Italian battle-painter, born at Naples in 1600. A fellow-student of Salvator Rosa's at Spagnoletto's studio, he himself subsequently became the founder of an academy of much resort. In accordance with his turbulent impulsive nature, he flung himself into the political struggles of the times, and during Masaniello's outbreak, organised his numerous scholars and dependants into a secret band, which inflicted deadly retaliation on the Spaniards. On the suppression of the insurrection, F. fled to France, but subsequently returned to Naples, where he died in 1663. The works of this painter, representing chiefly military scenes, are few in number, and costly in price; they are prized for their extreme fidelity to nature, as much as for their harmony and brilliancy of colour, and their variety of expression.

FA'LCONER, WILLIAM, was born in Edinburgh, about 1730, and was one of a family of whom all, excepting himself, were deaf and dumb. He went early to sea, serving his apprenticeship on board a merchantman; and before he was 18 years of age he was second mate, in a vessel in the Levant trade, which was shipwrecked off Cape Colonna, himself and two others being the only portion of the crew saved. He published *The Shipwreck* in 1762, and during the next year he entered the navy as midshipman in the *Royal George.* When peace came, he resided in London, where he wrote a satire on Wilkes, and compiled a *Nautical Dictionary.* He proceeded to sea in September 1769, as purser in the *Aurora* frigate; reached the Cape of Good Hope in December; and perished with his companions—the *Aurora* having gone down—in the Mozambique Channel.

F. wrote several poems, but *The Shipwreck* is the one on which his fame rests. It abounds in nautical language, and has the rare merit of being interesting. It is not a great poem, but it has always had its readers and admirers. In the second edition, the author added the characters of Albert, Rodmond, Palemon, and Anna—characters bearing the same relation to actual sailors that Alexis and Chloe bear to actual shepherds and shepherdesses—and to some extent destroyed that singleness of impression which was the chief merit of his work.

FA'LCONET, a name used in the 15th and 16th centuries for the smallest class of cannon. The ball weighed from 1 lb. to 3 lbs., and the gun from 5 cwt. to 15 cwt.

FALCONI'DÆ, a family of diurnal birds of prey (see ACCIPITRES), corresponding with the Linnæan genus *Falco*, and exhibiting those characters of muscular vigour, armature of beak and talons, and power of flight, which are to be found in their highest perfection in the true Falcons (q. v.), and in a scarcely inferior degree in the Eagles (q. v.). The species are numerous; the British Museum alone contains specimens of almost 200 unquestionably distinct species; but very many supposed species have been named and described by ornithologists, which, in the progress of science, have been ascertained to owe their distinctive characters merely to age and sex. The female is generally larger than the male; and the plumage of the young different from that of the adult. There are, in the different groups, considerable diversities in the curvature and strength of the bill, which also has the cutting edges of the mandibles either notched, festooned, or plain; the legs and toes also exhibit diversities as to length, strength, feathering, &c.; and in some groups, the wings are much longer, and at the same time more pointed, than in others. This is particularly the case with the true falcons, as contrasted with eagles, hawks, buzzards, kites, harriers, &c., and, in the language of falconry, the former—having the second quill-feather longest, and the first nearly equal to it—are called *noble birds of prey* (see FALCONRY), being those usually domesticated and trained for the service of man; the latter—having the fourth quill-feather longest, and the first very short—are called *ignoble birds of prey*, even Eagles receiving this designation. The F. are distributed over all parts of the world; and almost all kinds of vertebrate animals, except the largest quadrupeds, are the prey of some of them. Some also devour insects. Like the *Felidæ* among ravenous quadrupeds, the F. do not willingly feed on carrion, but generally seize and kill their own prey. As in the *Felidæ*, also, there is a provision for the preservation of the claws from being blunted by unnecessary contact with the ground, or with any hard substance, the F. contracting the toes so as to elevate their claws. The F. generally live in pairs.


Head and Foot of Brazilian Eagle.

The Lammer-geyer (q. v.) connects this family with the Vultures; the Secretary (q. v.), whilst in many respects agreeing with the F., is peculiar in some of its characters.

FA'LCONRY, the term applied to the art of training certain of the falcon tribes to the pursuit and capture, on the wing, of birds such as the heron, partridge, lark, rook, magpie, wild-duck, pigeon, &c. In ancient times, this sport was called HAWKING, a term still preserved in many places, and which, perhaps, is the more strictly correct of the two. Now a days, *Falconry* is the term applied to the sport and all that pertains to it; *Hawking* to its actual practice in the field. F. is of very ancient origin, and has been traced back, as an Eastern sport, to a period anterior to the Christian era. In Britain, it seems to have been followed before the time of the Heptarchy; and in the celebrated Bayeux tapestry, Harold is figured with a hawk upon his hand. It seems, however, to have been practised in Eastern countries, and in Central Europe, long before it became established in Great Britain; and to such a height did the sport reach in Germany, that nobles, and even kings, seem to have devoted to it the greater part of their time. As an instance of this, the Emperor Frederic II. of Germany was a passionate admirer of the sport, and is said to have written a treatise on F., published by J. G. Schneider in 1788 (2 vols. Leip.). In England, after the Norman Conquest, F. seems to have taken rapid strides, being much indulged in by kings, nobles, and ladies; and in those days the rank of the individual was indicated by the particular species of hawk carried on his wrist. Thus, an earl carried a Peregrine Falcon. In the 17th c., the sport declined; in the 18th c. it partially revived, but again fell off about the year 1725, when the art of shooting birds on the wing came into fashion. In the present day, an attempt is being made in several quarters in England to restore this noble sport, and already its restoration is being attended with growing success. In India, Persia, and other Eastern countries, F. is still eagerly practised, the methods there followed being for the most part nearly similar to those of Great Britain.

In F., two distinct kinds of hawks are used—the long-winged or true falcons, and short-winged. The first (noble birds of prey) are represented chiefly by the Gyrfalcon and Peregrine; the second by the Goshawk and Sparrow-hawk; and though for certain purposes the male is superior, as a rule the *females* of each species are much more highly esteemed for sporting purposes, from their being larger and more powerful. 'Long-winged' hawks may also, as a rule, be distinguished from the 'short-winged,' by their having a 'tooth' or notch on the upper mandible; from the second feather of the wing being either longer, or as long, as the third; and from their impetuous 'stoop' at their prey.

The Gyrfalcon (q. v.) is the largest species, but from its extreme rarity in the British Islands, is seldom used. The Peregrine Falcon is the bird in greatest favour with falconers, and if taken from the nest, as is usually the case, and carefully trained, affords better sport than any other British species. We shall therefore confine our remarks, for the most part, to the sport as it is practised with this bird.

No hawk is fit for sporting purposes until it has undergone a careful process of training. The young hawk is more easily trained than that which has been caught in a wild state, but in either case, a number of operations require to be gone through before the sportsman ventures to take his falcon into the field. Taken from her nest on some high and dangerous cliff when nearly fledged, the *eyess*, or young falcon (with her companion-fledglings, usually two in number), is carefully conveyed to the falconer's home: there she is kept in an open shed in a nest of straw, and fed several times a day upon fresh beef, with an occasional change of birds or rabbits. At this somewhat critical period, she should never be handled, except to put on the *jesses* and *bells* (see fig. 1), which afterwards become permanent fixtures. Her powers of flight, too, being as yet very limited, she depends upon her master for regular supplies of food, and soon learns to come for her meals at his call. Her meat is usually fixed to an apparatus termed the *lure* (see fig. 2), and thus the hawk is early accustomed to that important instrument, the further uses of which are explained below. By degrees her powers of flight are strengthened, and she is permitted to fly at large (returning to the lure at her master's will to be fed, or in hawking language, to remain *at hack*) for several weeks, during which time her meals are gradually reduced to one a day. While at hack, she sometimes becomes wild, wanders far from home, and kills game for herself; and when this is the case, she is usually caught by enticing her to a bow-net, close to which a pigeon or some meat is fastened to the ground. After being 'taken up' from hack, she is kept at the *block* (see fig. 3)—the stand upon which she sits—for a few days before her regular training begins. At this time, also, hawks require a bath twice or thrice a week.

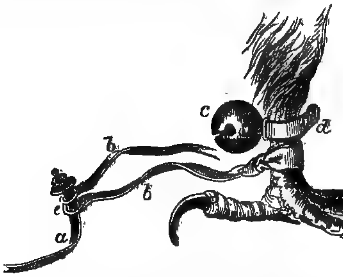


Fig. 1.—Leg and Foot of Hawk, shewing the method of attaching the Bells and Jesses:
a, the end of leash; *b*, *b*, the jesses; *c*, the bell; *d*, the bewit; *e*, the varvels of silver, with owner's name and address engraved.

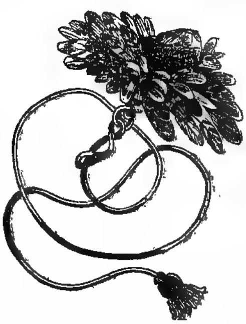


Fig. 2.—The Lure.

The first of the principal operations in training is *hooding*, an operation which, if successfully performed by the trainer during his earlier efforts, paves the way for overcoming many subsequent difficulties. It demands the greatest patience and the tenderest manipulation. The hood is a cap of leather (see fig. 3), made to fit the head of the falcon in such a manner as totally to obscure the light, a single aperture only being left, through which the beak protrudes, and a slit behind, through which are passed the braces or ties that secure the hood to the head. By shutting out the light, the hood is serviceable in tending to make the hawk quiet and tractable, but to accustom the falcon to submit to its use requires much time and great management. When, after great perseverance, this is achieved, the hawk is said to be '*made to the hood*,' during which process she also learns to sit balanced upon the fist. Besides tending to induce docility by hiding the light, the hood is of further service in shutting out from view any object which might cause the hawk to flutter or *bait* off the fist or *cadge* on its way to and from the field, &c. Hence the hawk is carried always hooded—the short-winged only being exempt. To the falcon's legs are attached two small hollow globes of thin metal, called *bells;* these, again, are fixed to their place by leather straps called *bewits;* and both, together with the jesses, become permanent fixtures even during the bird's flights. *Jesses* are two leathern straps, five or six inches in length, attached to each leg immediately below the bells; the jesses, again, are themselves attached to another leathern strap, called the *leash*, about four times the thickness of a boot-lace (see fig. 1), by two rings or *varvels;* and the bird being thus caparisoned, the falconer winds the leash through his fingers, and so prevents the falcon's escape while on his wrist. Instead of varvels, some falconers follow the Dutch plan of using a swivel; the former method, however, is now considered the best. A long cord, called the *creance*, is further attached to the leash, and is used for the purpose of giving the bird greater freedom during her training than that afforded by the leash alone.

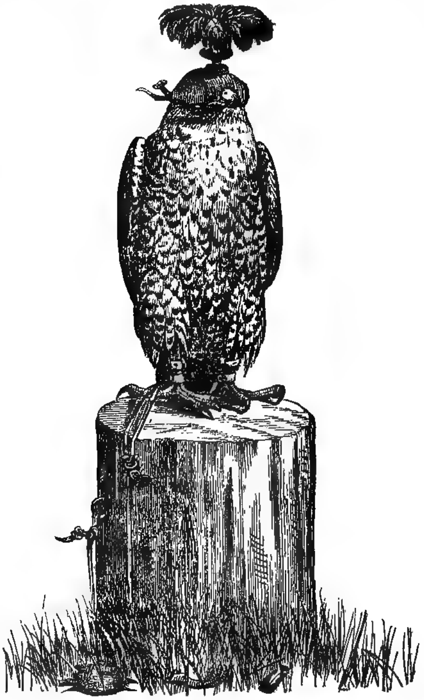


Fig. 3.—Hooded Peregrine Falcon on its block:
One end of the leash is attached to the jesses, the other to a ring driven into the side of the block; and thus the hawk is prevented from escaping.

The *lure* is a bunch of feathers attached to a cord and tassel, and in the centre of the feathers is usually a piece of spliced wood, to which a piece of meat may be attached. By accustoming the hawk to feed off the lure, or to come to it at a certain call or whistle to be fed when on the wing, the lure becomes an important adjunct to the falconer's apparatus, as by it he is enabled to entice his bird back after

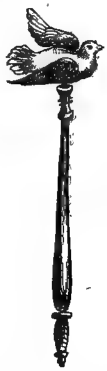


Fig. 4.—Tabur Stycke.

an unsuccessful chase. On such occasions, the falconer reclaims his bird by swinging the baited lure round and round his head, accompanying the action by some well-known call. Four wings tied together make a good lure. The *tabur stycke* and *drawer* were formerly used for the same purpose as the lure, but were made in the form of a stick.

In Europe, hawks are carried on the left wrist (while in the East they sit upon the right); and to protect the falconer's hand from being injured by the bird's claws, a glove of stout buckskin leather is used. And here it may be remarked, that the claws and beak of wild caught or *haggard* falcons, are usually pared or *coped*. If the bird to be trained, instead of being a nestling, happens to be a wild one, the difficulties of training are immeasurably increased, and can only be overcome by days and nights of unwearying exertion. If it proves unusually restless and difficult to tame, it is kept on low diet, is prevented from sleeping for several days and nights, and has cold water poured upon it by means of a sponge, &c. By these and other means, the falcon gradually loses much of its restiveness, and submits with tolerable readiness to the processes of training.

For training the *eyess*, or young falcon, to the lure, as preparatory to entering at game, Sir John Sebright says: 'Take the hawk out while very hungry, and let an assistant swing the lure round his head steadily, and at full length of the cord; upon this the falconer casts off his hawk with the usual whistle or halloo, still holding the *creance*, and the assistant suffers the lure to fall to the ground, for fear of injury to the hawk, by striking it in the air with the two strings attached. When this lesson is perfect, the assistant, instead of suffering the lure to fall, withdraws it, and disappoints the hawk, which flies by him, and then returns, when he may be suffered to strike the lure and feed upon it. In process of time, the creance may be removed, and the hawk enticed to the lure from a considerable distance, and may then strike it in the air (if the lure is a light one), while swinging round the head of the assistant. After a still greater time, the hawk becomes so perfect that she will circle round the head of the falconer, waiting for the lure to be thrown, and is then said to "*wait on*" perfectly. When the hawk is feeding on the lure, the falconer should encourage her, and suffer her to finish without alarm, by which she will be shewn that she may do so without fear, and will readily suffer herself to be taken after flying. She should also be accustomed to horses, men, and dogs.'

Having 'made the hawk' to *the fist*, *the hood*, and *the lure*, she is next 'entered' at her game (the *quarry*). This is done by tying a long cord or *creance* to the varvels of the jesses, and flying the hawk from the hand at a bird thrown out to it, also restrained by a cord. The hawk is next flown several times without a creance at birds *shortened in their flight*, after which it is ready to be entered at wild quarry. In case of failure, however, a live bird, similar to that at which she is flown, should be carried to the field, and thrown out to her in a creance by way of encouragement.

The heron is, and always has been, a favourite object of pursuit in British F., the period of the year best adapted for the sport being the breeding season. Having previously ascertained the feeding-place of that bird, the hawking party makes for the spot, usually towards evening, if possible in a direction *down-wind* from the heronry, so as to intercept the bird in its *up-wind* flight homewards. When a heron is seen to pass, a couple (a cast) of hawks are unhooded and 'cast off,' and the chase commences. The heron, seeing the falcons approach, disgorges its food, to lighten itself, and immediately ascends in the air; the hawks, eager in pursuit, and quicker of wing, speedily make upon it, and strive to gain a greater elevation by a series of beautiful gyrations. When one of the hawks succeeds in rising above the heron, it *stoops*, that is, descends swiftly, and in a direct line, upon the game, aiming a stroke with its outstretched legs and talons at its body; this the heron almost always succeeds at first in eluding, by a rapid and sudden movement aside. The second hawk, which by this time has also soared, then stoops, while the first is regaining its former altitude; and so on for many successive times, till one hawk at length clutches the heron or *binds*, upon which her companion joins her, and the three, buoyant by the motion of their wings, descend gently to the earth. The falconer's imperative duty is now to be up or near the spot where the three birds are descending, to divert the attention of the hawks before they reach the ground, and entice them from the quarry to him, by means of live pigeons as lures. This is very necessary, as the heron is extremely dangerous, and has been frequently known to injure the hawks with its sharp beak when on the ground, though it is all but perfectly harmless while in the air. When the heron's wounds have been dressed—for this bird is rarely killed in such encounters—a ring with the captor's name is usually affixed to its leg, after which it is set at liberty, and so becomes available for future sport. The falconer's usual cry of encouragement to his hawks upon the springing of the quarry, is 'Hooha-ha-ha-ha!' His cry when the quarry is killed, is 'Whoop!' A falcon takes its prey either by tearing or *raking* it with the *hind* claw of each foot at the instant of passing, or by clutching the victim with its talons, and when she thus succeeds in binding to her quarry, she slowly descends with it to the ground. The supposition that the hawk strikes its quarry with the beak or breastbone in its swoop, is a mistaken one.

Besides the Peregrine Falcon, the Merlin is trained for F., and is extremely bold. This bird, however, is flown at small game, chiefly larks. The Goshawk, though it does not soar and stoop, flies direct at its game: it is used chiefly for pheasants, rabbits, hares, &c., in an enclosed country. The Sparrow-hawk, from its extreme boldness, is a great favourite, but is flown at smaller kinds of birds only, such as blackbirds and thrushes, &c. The Hobby is seldom or never used.

The following are the principal terms used in falconry. A falcon's legs, from the thigh to the foot, are termed *arms;* toes, *petty singles;* claws, *pounces;* wings, *sails;* tail, *train;* crop, *gorge;* lower stomach, *pannel;* feathers, hair, &c., ejected at the mouth, *the castings.* A young hawk from the nest is *an eyess* or *eyas;* one that can hop, but not fly well, *a brancher;* a nestling hawk reared at liberty, is a *hack-hawk;* a young hawk able to take game, a *soar-hawk;* a mature wild hawk is a *haggard* or *blue hawk;* young hawks taken in their migrations, are *passage-hawks*, or *red hawks*—the term *red* being applied merely as a title of distinction between the young hawk and the eyess or nestling, the colours of the two being in reality the same. The training of the passage-hawk and haggard is termed *reclaiming;* fluttering, is *baiting;* fighting with each other, *crabbing;* sleeping, *jouking.* The prey is termed the *quarry.* When the hawk strikes her quarry in the air and clings to it, she *binds;* when she flies off with it, she *carries;* when she plucks it, she *deplumes.* Dead game is *the pelt.* *Stooping* or *swooping* is the act of descending with closed wings from a height at prey. Direct flight, without soaring, is *raking off;* changing from one bird to another, *checking.* When game flies into a hedge, it *puts in.* When the hawk is moulting her feathers, she is *mewing;* after her first moult, she is *intermewed;* with complete plumage, *summed;* when in good condition, she is *enseamed;* when out of condition, *seamed.* Mending the feathers artificially (an operation frequently performed when one has been accidentally broken) is termed *imping;* blunting bill and talons, *coping.* When the falcon is obediently flying round in the air, she *waits on her master;* flying long-winged hawks from the wrist, is termed *flying out of the hood;* a couple of hawks is a *cast.* The *cadge* is a frame of wood with four legs. It is carried by means of straps, which pass over the bearers' (the cadgers') shoulders, and is used, when there are several casts of hawks, to be taken to the field. The *block* (see fig. 3) is a round piece of wood, such as would be made by sawing a foot of wood out of a felled larch-tree of some twenty years' growth; and upon this the hawk sits when out of doors. Through the bottom of the block runs an iron spike, which being driven into the ground, secures the block to its place, and so prevents the hawk from dragging it away. Falcons are very pugnacious, and if not carefully kept separate, would soon kill each other. The *screen* or *perch* is a perch guarded by a falling piece of canvas, to support the hawks in case of their leaping down; upon this, the hawks are placed at night in an apartment called the *mews.*

The best works on the subject are those of Turberville and Latham, respectively, as old treatises; and that of Sir John Sebright, as comparatively modern. Of the more recent treatises, *Falconry in the British Isles*, by Salvin and Brodrick (Lond. 1855), and *Falconry, its Claims and Practice*, by Freeman and Salvin (Lond. 1859), are the best authorities.

The village of Falconswaerd, near Bois-le-Duc, in Holland, has for many years furnished falconers to almost all Europe. Sir John Sebright says: 'I have known many falconers in England, and in the service of different princes on the continent, but I never met with one of them who was not a native of Falconswaerd.'

FALE'MÉ, one of the most important tributaries of the Senegal (q. v.), into which it falls, in lat. about 14° 40′ N., and long. 11° 48′ W. Its course has not yet been fully explored.

FALE'RII, a city of ancient Etruria, was situated west of the Tiber, and north of Mount Soracte. Its earliest historical appearance is in 437 B. C., when, according to Livy, the inhabitants (who were called Falisci) joined with those of Veii in assisting the Fidenates against the Romans. The Falisci were among the most dangerous enemies of Rome, and were the last of the Etrurians who submitted to its power. Their city was at last destroyed by the Romans (241 B. C.), and they themselves were compelled to choose a new site a few miles off. Here a Roman colony was settled in the time of the triumvirs, whence the place took the name of *Colonia Junonia Faliscorum.* But this Roman F. does not appear to have ever acquired any importance, for the temple which anciently attracted so many pilgrims, stood on the site of the older town. During the middle ages, however, a new city sprung up on the ruins of the Etruscan F., which finally obtained the name of *Civita Castellana* (q. v.). Ruins of the Roman or later F., consisting of a part of the ancient walls, are still visible.

FALE'RNIAN WINE, so called from *Falernus Ager*, the district in which it was grown—and which lay in the northern portion of Campania, between the Massican Hills and the northern bank of the Vulturnus—was one of the favourite wines of the Romans. It is described by Horace as, in his time, surpassing all other wines then in repute, and seems to have been in great favour with the poet himself. In the time of Pliny, however, as he himself informs us, Falernian wine had already, owing to a want of care in its cultivation, begun to decline in quality; and the wine then esteemed the best was a variety grown in the Falernian neighbourhood, and called *Faustianum.*

FALIE'RI, MARINO, a celebrated Venetian, was born about the year 1284. He was elected in 1354, at the age of 70, Doge of Venice, and was the third of his name called to this supreme dignity, but was decapitated in the following year for his daring conspiracy against the rights of the commonwealth, which, previous to his election, he had zealously served in the capacities of commander of the forces, commander of the fleet, and ambassador. At the siege of Zara, in 1346, he defeated an army of 80,000 Hungarians, vigorously pursuing at the same time extensive siege-operations, and in the course of the war, having assumed the command of the fleet, captured Capo d'Istria. Subsequently, he became ambassador of the republic to Rome and Genoa. Of an ungovernable and implacable temper, his bitter resentment seems to have been roused by a grossly offensive libel on his fair and youthful wife, the author of which, a young patrician named Michele Steno, owed some grudge to the doge. The punishment awarded to the young noble by a patrician tribunal seemed to F. wholly inadequate to the offence by which his ducal dignity had been outraged, and in order to avenge this double slight, he organised an audacious plot, with the object of overthrowing the republic, and massacring the heads of the aristocracy, to be followed by his own assumption of sovereign rights. The conspiracy was, however, revealed on the eve of its execution, and F. was arrested. He suffered death by decapitation on the 17th of April 1355, on the very spot where, a year previously, he had been tendered universal homage as supreme magistrate of the state. In the hall of the great council, which contains the portraits of all the doges, the space allotted to that of F. is draped with a veil of sable, and bears the following inscription: 'Hic est locus MARINI FALETRO, decapitati pro criminibus.' A faithful representation of the plot, and of its chief confederates, is given in Byron's drama of *Marino Falieri.*

FA'LKIRK, a Scottish parliamentary burgh, situated on a rising ground in the midst of a populous mineral and manufacturing district in Stirlingshire, near the old Roman wall of Antoninus, with no pretension either to beauty of situation or to architectural or other elegance. Pop. in 1861, 9029. In 1600, it was made a burgh of barony by King James VI., in favour of Alexander Lord Livingstone, afterwards Earl of Callander, in whose favour also it was in 1646 created a burgh of regality by King Charles I. In 1715, it passed to the crown by the forfeiture of the Earl of Linlithgow and Callander; and it was not till the passing of the Reform Bill in 1832 that it was made a parliamentary burgh, and received a municipal constitution, with a council of twelve, including a provost, three bailies, and a treasurer. It unites with Airdrie, Hamilton, Lanark, and Linlithgow, in sending a member to parliament. It has nine yearly fairs, an extensive inland trade, various local manufactures, and charitable institutions. Its parish church—the Eglais Bhrec, Varia Capella, or Speckled Kirk of our chartularies and of local tradition—has one or two monuments of some antiquity, but was itself rebuilt in the year 1810. The church, church lands, and barony belonged of old to the Abbey of Holyrood. Near F., in 1298, Sir William Wallace made his masterly retreat from the disastrous battle (see FALKIRK, BATTLE OF), in which he lost his brave companions in arms, Sir John Graham and Sir John Stewart, both said to be interred in the parish churchyard. The inscribed stone alleged to cover the grave of Sir John Graham, is apparently more modern than his time. In 1746, the neighbourhood of F. was the scene of another battle, in which the royal troops were defeated by those of Prince Charles Edward. It is now chiefly noted for its well-known cattle-trysts, at which stock is yearly sold to the amount of about £1,000,000. In the immediate vicinity are the well-known Carron Ironworks, the Forth and Clyde Canal, and the Edinburgh and Glasgow, and Scottish Central Railways.

FALKIRK, BATTLE OF. Wallace had followed up his victory over the English near Stirling in 1297, by taking possession of some of the more important fortresses of Scotland. In the following year, King Edward, having returned from Flanders, summoned a great army to meet him at York, and marched northward to Roxburgh, and thence along the east coast of Scotland and the shore of the Firth of Forth. It was not till the day of the battle, the 22d July 1298, that Edward first saw the enemy. The Scottish infantry, much inferior in numbers to the English, were arranged in four circular bodies on a small eminence near Falkirk, and were armed with lances, and with bows and arrows. The cavalry, numbering only 1000 men, were placed in the rear. This array was charged by the English cavalry. The Scottish footmen bravely withstood the onset of the well-appointed English horse; but the cavalry, dismayed by the preponderating numbers of the enemy, rode from the field without striking a blow. Thus left without support, the spearmen and archers were compelled to yield, and the retreat became general. The loss on the Scottish side is said to have amounted to 15,000 men. The results of this defeat were, that the military power of Scotland, such as it was, was broken; and Edward returned to England master of all the important strongholds of the south.

FA'LKLAND, a royal burgh of Scotland, in the county of Fife, is situated at the north-eastern base of the Lomond Hills, 22 miles north of Edinburgh, and 10 miles south-west of Cupar. The east Lomond Hill rises so abruptly behind the town as to intercept the rays of the sun from it for several weeks during winter. F. was in early times a manor of the Earls of Fife. It passed from them to the crown in 1425, and was made a royal burgh by James II. in 1458. Within the town are the remains of Falkland Palace—a large tower (in the same style as the north-western tower of Holyrood) above a vaulted doorway leading into the courtyard, built about 1500, and two sides of a quadrangle, built between 1530 and 1550, fine and interesting examples of Scottish architecture. The palace was a favourite residence of King James IV., and after his death, in 1513, his widow, the impetuous sister of King Henry VIII. of England, was here kept in restraint for a season. Here her son, King James V., died in 1542. The last king who occupied the palace was Charles II., who passed a few days in it in 1650. Of the more ancient castle in which David, Duke of Rothesay, was imprisoned and starved to death by the Duke of Albany, in 1402, no traces now remain. F. is frequently alluded to in the verses of Sir David Lindsay. Pop. (1861) 2938, who support themselves mainly by handloom weaving.

FALKLAND, LUCIUS CARY, VISCOUNT, was born, it is believed, at Burford, in Oxfordshire, in 1610, and educated first at Trinity College, Dublin—his father, Henry Cary, Viscount Falkland, being at that time lord-deputy of Ireland—and afterwards at St John's College, Cambridge. Even during his father's lifetime, he enjoyed an ample fortune, left him by his grandfather. His earlier years were wholly devoted to study, and to the conversation of learned men, among whom he himself, by all accounts, must have occupied a first place. His residence (Burford) was only ten miles from Oxford, and here, according to Clarendon, 'he contracted familiarity and friendship with the most polite and accurate men of that university. The praise which that historian bestows on him is extraordinary; but F. is one of those historical personages whose character and abilities we must take on the word of friends and panegyrists, if at all, for his deeds and writings are not equal to his fame. In 1633, he was made one of the gentlemen of the privy-chamber to Charles I., and took part in the expedition against the Scots in 1639. In 1640, he entered parliament as member for Newport in the Isle of Wight, and was at first distinguished by his patriotic zeal for the laws and constitution of his country. Against such men as Strafford and Finch he exhibited great severity of speech, though even in their case his almost finical love of the forms of legal procedure was manifested. Shortly after, he conceived it to be his duty to assume quite a different political stand-point, and to oppose what seemed to him the excesses and illegalities of the popular party. On the breaking out of the civil war, he consequently took part with the king, though mourning deeply the miseries which his country was about to suffer. He died a soldier's death at the battle of Newbury, September 20, 1643. F. was quite unfitted to play a practical part in the sanguinary politics of his time; but his genuine love of England and of the rights of the nation, which burned in him as strongly when a royalist as when attacking Strafford and the bishops, enables us to understand, better than we might otherwise have done, the deep indignation that possessed the English gentlemen who represented the Commons, at the arrogant and unprincipled policy of Charles's advisers. F. wrote various treatises, &c., the principal of which is *A Discourse on the Infallibility of the Church of Rome.*

FALKLAND ISLANDS, the only considerable cluster in the South Atlantic, lie about 300 miles to the east-north-east of the Strait of Magellan, stretching in S. lat. from 51° to 52° 30′, and in W. long. from 57° 40′ to 61° 20′. After having successively belonged to France and Spain, they have, since 1771, formed part of the British empire; and in 1833 they began to be settled, being, as a whole, the most southerly of the organised colonies of England. They number about 200, presenting a total area of about 13,000 square miles. Pop. (1858) 621. The two largest members of the group, East Falkland and West Falkland, comprise between them more than half the surface; and of the remainder, the chief ones are Great Swan, Saunders, Keppel, Pebble, Eagle, and Jason. This possession is valuable mainly from its position with respect to the Southern and Pacific Oceans, being in this connection all the more valuable on account of its many excellent harbours. Both the soil and the climate are much better adapted to pasturage than to cultivation. While the natural grass is extremely luxuriant, scarcely anything but a few vegetables is grown in the settlement. The coasts teem with fish, more especially with cod; and in certain seasons of the year, penguins and seals are killed in great numbers for the sake of their oil. The temperature is very different from that of the corresponding parallels in the south of England, being both lower in summer and higher in winter. The mean of the former season is about 53° F., and of the latter, about 40°. These averages considerably exceed the vague estimates of early navigators, who, coming suddenly down from the tropical heats, appear to have here felt, by comparison, something of hyperborean cold. Though there is no timber worthy of the name, yet peat abounds to the depth of ten feet. In 1857, the revenue and expenditure respectively were £5640 and £5546; while, in the same year, the arrivals from abroad shewed 40 vessels and 18,415 tons. In 1856, the imports amounted to £11,300, and the exports to £11,800.

According to an official return for 1858, 20 acres have been reclaimed for horticulture in the neighbourhood of Stanley, the seat of government; and the sheep, chiefly Cheviots and Southdowns, amounted to 8000; the wool commanding a good price in London, and the mutton finding a ready market on the spot. The peace of the colony, previously guarded by a single constable and casual aid, had been secured by the arrival of a small garrison of embodied pensioners.

FALL. The doctrine of the Fall is the doctrine of the historical introduction of evil into the world, as described in the third chapter of the book of Genesis. The statement of this chapter in its natural and obvious meaning is to this effect, that the serpent, which 'was more subtil than any beast of the field which the Lord God had made,' tempted the woman to eat of the tree of the knowledge of good and evil, regarding which the Lord God had said, 'Thou shalt not eat of it: for in the day that thou eatest thereof thou shalt surely die.' In contempt of this command and warning, 'the serpent said unto the woman: "Ye shall not surely die: for God doth know that in the day ye eat thereof, then your eyes shall be opened, and ye shall be as gods, knowing good and evil." And when the woman saw that the tree was good for food, and that it was pleasant to the eyes, and a tree to be desired to make one wise, she took of the fruit thereof, and did eat, and gave also unto her husband with her; and he did eat.' The result of this was, that their eyes were opened, and they knew that they were naked; and when they heard the voice of the Lord in the garden, they hid themselves; and on being summoned, they acknowledged their transgression, and were driven forth from Eden. Separate punishments, also, as the consequence of the transgression, were denounced against the serpent, the woman, and the man. The first was cursed above all cattle, and condemned to go upon its belly, and to eat dust all the days of its life. Enmity was to be put between it and the woman, and between its seed and her seed; 'it shall bruise thy head, and thou shalt bruise his heel.' The woman was to bring forth children in sorrow, and to be subject to her husband, to whom her desire was to cleave. The ground was cursed for the man's sake, and he was to eat of it in sorrow all the days of his life; in the sweat of his face he was to eat bread till he returned to the ground.

Such is the narrative of Genesis, upon which the doctrine of the Fall is based. The doctrine assumes various forms, according to the interpretation which the narrative receives. Some theologians interpret the narrative more literally—although none can be said to do so quite literally—and others interpret it more figuratively; while others reject it altogether as a narrative, and look upon it merely as a mythical story of the early time—mirroring the lapse from a primitive golden age, or age of innocence.

1. Even the most orthodox theologians so far spiritualise the narrative, or regard it figuratively. The serpent, for example, is with them the devil, although the text in Genesis itself gives no hint of such an interpretation. The enmity between the serpent and the woman is the enmity between the devil and mankind; and the bruising of the head and the heel is supposed to represent the victorious conquest—although not without wounds and bruises—of Jesus Christ, as the Messiah, over the devil. The doctrine of the Fall, according to the most common mode of interpretation, may be stated in the following terms: 'Our first parents being seduced by the subtlety and temptation of Satan, sinned in eating the forbidden fruit. By this sin, they fell from their original righteousness, and communion with God, and so became dead in sin, and wholly defiled in all the faculties and parts of soul and body. They being the root of all mankind, the guilt of this sin was imputed, and the same death in sin and corrupted nature conveyed to all their posterity, descending from them by ordinary generation.'—*Westminster Confession of Faith*, c. vi. The Fall, in this view, is the temptation of our first parents to eat by the devil, and the inheritance of this act by their natural descendants. This may be said to be the orthodox doctrine of the Christian church.

2. Other theologians consider the third chapter of Genesis to be in the main allegorical—representing a picture of the violence of appetite in our first parents. In this view, the serpent is a mere imaginary accessory—the emblem of temptation; the supposed interview between God and our first parents is of the same character—the emblem of the voice of conscience following unlawful indulgence; the tree of the knowledge of good and evil represents some form of sensual indulgence. The only realities in the picture are the moral realities, conscience and temptation in some carnal form—realities which were no more powerful in the case of our first parents than they are in the case of all their descendants who yield to unlawful indulgence, as they did. The doctrine of the Fall, according to this interpretation, is simply the doctrine of the abuse of free will in our first parents; and the question of the relation of this primary sin to all subsequent sin, is variously regarded by this class of theologians. All of them would repudiate any formal imputation of it; yet all or most allow some actual transmission or inheritance of corrupted will, as the consequence of the original abuse of it.

The Pelagian theory maintained, indeed, that the race was not the worse of Adam's fall; but that, as our first parents 'were to blame for yielding to a temptation which they might have resisted, so all of us, by a proper attention in cultivating our natural powers, may maintain our innocence amidst the temptations with which we are surrounded; and, therefore, that we fall short of that which it is in our power to do, if we do not yield a more perfect obedience to the law of God than Adam yielded.' The Arminian theory, again, contended that the chief loss of the race, as the consequence of the transgression of our first parents, was the subjection to death thereby incurred, and the moral disadvantages arising out of the fear of death. Others, more orthodox than either, contend that the spiritual unity of the race necessarily implies that the depraved will of our first parents has descended to their posterity as their unhappy portion.

3. The opinion of those who look upon the chapter in Genesis as a mere myth or fable, representing a dream of the religious imagination, without any special moral meaning, cannot be said to come within the pale of Christian theology. The doctrine

of the Fall is with them only a devout idea, inconsistent with their principles of philosophy and history, and which, accordingly, they dismiss from their speculation or concern altogether.

FALL OF THE LEAF. See DECIDUOUS TREES and LEAVES.

FALL RIVER, a remarkable stream of Massachusetts, in the United States, is only about two miles long. Throughout nearly the whole of its course, it tumbles between lofty banks over a rocky bottom, descending in its last half mile fully 130 feet. This lower section of the torrent is literally crowded with mills, which scarcely leave room for air and light between each other. The mouth is on the eastern arm of Narraganset Bay. F. R. is the name likewise of the adjacent locality. The town, or rather the township, contains about 15,000 inhabitants, who are chiefly employed in connection with the water-power already mentioned. The principal manufactures are woollens, cottons, and ironware. The place, moreover, has an excellent harbour—safe and capacious, with deep water, and of easy access.

FA'LLACY. The incorrect performance of the process of reasoning, so as to lead to error, is said to be a fallacy. The science of Logic reduces sound reasoning to certain rules, and when any of these rules is violated, a logical fallacy is the result. There is always included in logical treatises a chapter on fallacies, in which the several kinds are classified and illustrated. In the old writers, there was always a division into two classes, according as the error lay in the *form* of the reasoning, or in the *matter;* the formal were entitled *in dictione*, or those appearing in the expression; the material were entitled *extra dictionem*, implying that the fault could not be detected from the language, but must be sought in a consideration of the meaning or subject-matter. As some of the designations employed in detailing these various kinds of erroneous reasoning have passed into common use, we shall first give a short notice of the ancient classification.

The formal, or those *in dictione*, were direct breaches of the laws of syllogism, or of argumentation from premises.

The fallacy of *undistributed middle* is one of the cases where what is called the middle term of a syllogism is used in two senses. 'A term is said to be "distributed" when it is taken universally, so as to stand for everything it is capable of being applied to; and, consequently, is "undistributed" when it stands for a portion only of the things designated by it. Thus, "all food," or every kind of food, are expressions which imply the distribution of the term "food;" "some food," would imply its non-distribution.' In such a proposition as 'all food is obtained from the vegetable or animal kingdoms,' the term is distributed, because it is meant to be affirmed of every article used as food, that such article is derived from one or other of these two sources. But when we say 'food is necessary for life,' we mean only a limited number of articles. Hence such a syllogism as the following: 'Food is necessary to life; corn is food; therefore, corn is necessary to life,' is faulty from undistributed middle; the major proposition, 'food is necessary,' &c., has the form of a universal proposition, with the reality of a particular one.

The *æquivocatio*, or *ambiguous middle*, is the case where a word is used in two senses so different as to give properly no middle term, and, therefore, no connecting link between the premises and the conclusion. A favourite example of this is the following: 'Every dog runs on four legs; Sirius (the dog-star) is a dog; therefore Sirius runs on four legs.' This is merely playing with the ambiguity of a word. Dr Whately has shewn that this fallacy may often arise with words derived from the same root, but acquiring from usage different significations; thus, 'projectors are unfit to be trusted; this man has formed a *project*, therefore he is unfit to be trusted;' where the argument supposes that the meaning of 'projector' and 'one who has formed a project' is the same, which it is not.

The fallacy of *composition and division* arises by using a word distributively that is meant collectively; thus, 'five is equal to two and three; two and three are even and odd; therefore five is even and odd.'

'The fallacy of *accent* was an ambiguity arising from pronunciation. Thus, by a false accent in reading the commandment, "thou shalt not bear false witness against thy neighbour," it might be suggested that subornation is not forbidden, or that anything false except evidence is permitted, or that false evidence may be given *for* him, or that it is only against neighbours that false witness is not to be borne.'

The *fallacia accidentis* is still a form of the ambiguous middle. It is when we conclude of a thing something that is only true of it accidentally, as, 'wine is pernicious, therefore it ought to be forbidden.' The premise is true only of the immoderate use, the conclusion refers to its use in every form. Another fallacy, the converse of this, is arguing *à dicto secundum quid ad dictum simpliciter* (passing from what is true in some respect to what is true absolutely). Of this the stock example is: 'What you bought yesterday you eat to-day; you bought raw meat yesterday, therefore you eat raw meat to-day.'

The most usually quoted of the second class of fallacies—*extra dictionem*—are the following:

Ignoratio elenchi, or 'ignorance of the refutation.' This means mistaking the point in dispute; or proving something that an opponent does not deny. This is common enough in controversy. See an example in point in ETHICS.

The *petitio principii*, or 'begging of the question.' This is when, instead of proving a position by some different position, something is assumed that is identical with what is to be proved. The most common form of this fallacy is what is termed *reasoning in a circle*, where we make two propositions mutually prove each other. The following would be an example of this mode of reasoning. Suppose we asked why smoke ascends, and any one were to answer, 'because it is light;' we then inquire how it is known to be light, and the reply is, 'because it ascends.'

The *non causa pro causa*. This is a fallacy of insufficient induction, or the inferring a connection of cause and effect where there is only a mere sequence or accompaniment; as when we allege that the prosperity of England is due to its having an aristocracy, or an Established Church, or any other circumstance that has attached to the country, without ascertaining that there is any real causation between the two facts. Empiricism in medicine is of this nature; such a one took a certain medicine, and recovered from an illness, therefore the medicine was the cause of the recovery. The *post hoc, ergo propter hoc*, is another expression for the same fallacy, which is one of wide range, and whose rectification far transcends the limits of scholastic or formal logic.

The *argumentum ad hominem* is a reference to the circumstances of the party addressed, and means that although a certain reasoning may be good in itself, such party is not entitled to urge it, having perhaps already repudiated the same reasoning in other cases, or acted in a manner inconsistent with the employment of it. (For a full exemplification of fallacies according to the foregoing enumeration, see De

Morgan's *Formal Logic,* Whately's *Logic,* Sir William Hamilton's *Lectures on Logic,* &c.)

The subject of fallacies has received a much more comprehensive treatment in the work on Logic by Mr J. S. Mill, who has enlarged the basis of the science itself, by placing Induction at the foundation of Reasoning, and by recognising the necessity of laying down rules for the correct performance of that process. See INDUCTION. This enables him to give a proper place to some of the preceding fallacies, such as the *post hoc, ergo propter hoc,* which, although occurring in treatises of syllogistic logic, does not violate any rule either of syllogism or of any process included in such treatises. In fact, if we take a complete view of all the cardinal operations that enter into the establishment of truth by evidence, we ought to enumerate four such operations—Observation, including experiment; Definition, or the right use of general terms; Induction; and Deduction or syllogism. Now, any one of these operations badly performed would necessarily lead to a wrong result, in other words, a fallacy. But in addition to the mistakes arising from the admission of insufficient evidence at any point, there is a class of errors (as well as truths) that arise from our receiving propositions without any evidence at all, on the ground that they are self-evident. In every case of reasoning, we must come at last to something that does not need a reason, as, for example, the evidence of our senses, or our actual observation; but we may sometimes admit as self-evident what is really not so, owing, perhaps, to our having a strong sentiment in the matter on hand. It is usual to consider the existence of an external material world, altogether independent of our minds, as certain in itself without requiring any proof or reason for the belief. It is found that we often commit mistakes in this way, and the mistakes thence arising Mr Mill illustrates under the title of Fallacies of Simple Inspection, or Fallacies *à priori,* which includes the whole of what may be termed Natural Prejudices. The other members of his classification follow his division of the processes concerned in the investigation of truth: they are Fallacies of Observation, Fallacies of Generalisation, including Induction, and Fallacies of Ratiocination or syllogism. He remarks, moreover, that error does not often take the form of a deliberate infringement of the rules of good observation, induction, or deduction, but rather consists in a confused perception of the premises involved. In other words, it is the 'not conceiving our premises with due clearness, that is, with due fixity; forming one conception of our evidence when we collect or receive it, and another when we make use of it; or unadvisedly, and in general unconsciously, substituting, as we proceed, different premises in the place of those with which we set out, or a different conclusion for that which we undertook to prove. This gives existence to a class of fallacies which may be justly called Fallacies of Confusion; comprehending, among others, all those which have their source in language, whether arising from the vagueness or ambiguity of our terms, or from casual associations with them.' It is in this group that Mr Mill places the *petitio principii,* the *ignoratio elenchi,* and ambiguous language generally (*Logic,* Book v.).

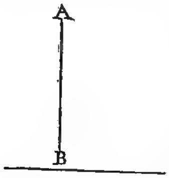
The scholastic fallacies were considered mostly in the light of weaknesses or involuntary errors of the intellect, to be corrected by sound rules or a good method of procedure. The syllogistic logician made little count of the natural prejudices, or strong emotions and passions of mind, which forcibly pervert the intellectual views, and render men averse to sound reasoning. This grand omission was first effectively supplied in the immortal first book of the *Novum Organon* of Bacon, who, in a vigorous and telling exposition, set forth some of the most powerful prejudices of the natural mind, and their influence in corrupting science and philosophy, as well the everyday judgments of mankind. Under the name of 'idola' he classed four different species of these moral sources of error, against which the mind had to be fortified, not by syllogistic rules, but by a self-denying discipline, and a highly cultivated perception of the true end of science, which was to increase human power in all the arts of life. His first class of idola were *idola tribus,* or delusions common to the human mind generally, such as errors of the senses, the over-susceptibility of the mind to impressions of sense, the limits of the human faculties, and the interference of prejudices and passions; a very comprehensive class, which even he has failed to do full justice to. The next class are *idola specûs,* idols of the den or cavern, by which he understands the peculiarities and idiosyncrasies of individuals. The third class, *idola fori,* idols of the market, are intended to include the abuses of language, or the various ways that our conceptions of things are distorted by names. The last class are the *idola theatri,* theatrical illusions, under which he rebukes the great system-builders of antiquity, such as Aristotle, for introducing fanciful and irrelevant considerations into philosophy; and dwells especially on the corrupting influences of superstition and theology, and also the poetical tendencies of the mind, which are not satisfied with truth unless it can take on in addition a certain warmth or brilliancy of colouring.

FALLING BODIES. Owing to Gravity (q. v.), all terrestrial bodies, if unsupported, *fall,* or move towards the earth's centre. When a falling body is absolutely without support, it is said to fall freely, as distinguished from one descending an inclined plane or curved surface. We shall here consider the two cases of free descent and of descent on inclined planes.

1. *Bodies falling freely.*—The first fact of observation regarding falling bodies is that they fall with a variable velocity; from this we infer that they are acted upon by some force. Again, on observing how the velocity varies, we find that its increments in equal times are equal; from this we conclude that gravity is a uniform force, which it is, at least sensibly, for small distances above the earth's surface. We have next to find a measure for this force. By experiment, it is found that a body in 1″ falls through 16·1 feet, and that at the end of 1″ it moves with such a velocity, that if it continued to move uniformly after the 1″ expired, it would pass over 32·2 feet in the next second. Hence 32·2 feet is the measure of the velocity which has been generated in 1″, and is therefore the measure of the accelerating force of gravity; for the measure of accelerating force is the velocity which it will produce in a body in a second of time. The quantity 32·2 feet is usually denoted by the letter g; and it is proper to mention here that this quantity measures the accelerating force of the earth's attraction on all bodies. Experiment shews that under the exhausted receiver of an air-pump all bodies fall with equal rapidity, and that the difference of velocities of falling bodies in air is due entirely to the action of air upon them.

As the accelerating force is uniform, it follows that the velocity generated in any time, t, will be given by the formula $v = gt$. Since the force is uniform, it must generate an equal velocity every second. In t'', therefore, it must generate a velocity gt, since it produces g in 1″. In 2″, a falling body will be moving with a velocity of 64·4 feet—i.e., were the velocity to become constant for the third second, it would in that second move through 64·4 feet.

We are now in a position to inquire more particularly how bodies fall, and to answer such questions as first: What time will a body falling freely take to fall through a given space? Second: What velocity will it gain in falling through a given space? Third: How high will a body ascend when projected straight up with a given velocity? &c.



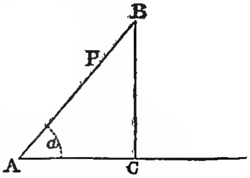
Let A be the point from which a body falls, and B its position at the end of the time t; and let AB = S. Then we know that at B the body has the velocity gt. Suppose, now, the body to be projected upwards from B towards A with this velocity gt—gravity acting against it, and tending to retard its motion. We know that at the end of a time t it will be again at A, having exactly retraced its course, and lost all the velocity with which it started from B, because gravity will just take the same time to destroy the velocity gt which it took to produce it. From this consideration we may obtain an expression for the space AB or S in terms of the time t. In the time t, the body rising from B with a velocity $= gt$ would ascend, if not retarded, a height $(gt) . t$, or gt^2. But in the time t, gravity, we know, carried it through S; it will therefore, in the same time, by retarding it, prevent it going to the height gt^2 by a space = S. The space through which it actually ascends is then represented by the difference $gt^2 - S$; but this space we know to be AB or S. Therefore $S = gt^2 - S$; or $2S = gt^2$, or $S = \frac{1}{2}gt^2$. We may give this equation another form. For v being the velocity acquired in the time t, $v = gt, \therefore t = \frac{v}{g}$. Then $S = \frac{1}{2}g . \frac{v^2}{g^2} = \frac{v^2}{2g}$. Hence $v^2 = 2gS$. From these formulæ, we see that when a body falls from rest under the action of gravity, its velocity at any time varies as the time, and the square of its velocity as the space described.

If the body, instead of starting from rest, has an initial velocity V; and if v, as before, be the velocity at the time t, then evidently v is = the original velocity + that which is generated by gravity, or $v = V + gt$; and the space will be that which would have been described by the body moving uniformly with a velocity V + that which it would describe under gravity alone, or $S = Vt + \frac{gt^2}{2}$. With regard to the last two formulæ, it is easy to see that they may be made to suit the case of a body projected upwards with a velocity V, by a change of signs; thus, $v = V - ft$, and $S = Vt - \frac{gt^2}{2}$; gravity here acting to destroy velocity, and diminish the height attained. From the general formulæ in the case of an initial velocity, whether the body be projected upwards or downwards, we may express v in terms of S, as we did in the case of motion from rest. For $v^2 = (V \pm gt)^2 = V^2 \pm 2g(Vt + \frac{gt^2}{2}) = V^2 \pm 2gS$.

These are all the formulas applicable to the case of falling bodies, and by their means all problems in this branch of dynamics may be solved. It also appears that the formulæ above investigated apply to all cases of rectilinear motion of bodies considered as particles under the action of any uniform force. In all such cases, if f measure the accelerating force $S = \frac{1}{2}ft^2$, $v^2 = 2fS$, for the case of motion from rest; and $S = Vt \pm \frac{1}{2}ft^2$, and $v^2 = V^2 \pm 2fS$, for the case of an initial velocity.

The reader can easily frame examples illustrative of the formulæ for himself. We subjoin one: A stone falls down a well, and in 2" the sound of its striking the bottom is heard. How deep is the well? Neglecting the time occupied in the transmission of sound, the formula $S = \frac{1}{2}gt^2$ applies, or S = depth $= \frac{1}{2}g . 2^2$, t being 2"; ∴ depth $= 2g$, or 64·4 feet.

2. *Bodies descending inclined planes.*—In this case the formulas already investigated apply with a slight change. In the figure, if P be a body on the inclined plane AB, descending under gravity, we observe that only that resolved part of gravity parallel to AB is effective to make it descend, the other part at right angles to AB merely producing pressure on the plane. The angle of inclination of the plane being a, we know (see COMPOSITION AND RESOLUTION OF FORCES) that the resolved part of gravity parallel to the plane is g sin. a. The body, then, may be conceived to be descending under a uniform accelerating force g sin. a. We obtain the formulæ, accordingly, for descent on inclined planes by substituting g sin. a for f in the general formulæ given above. We notice, however, that in descent on inclined planes the velocity acquired is, as in the case of bodies falling freely, due solely to the vertical height through which the body falls. By our formula, $v^2 = 2g$ sin. a . S, where S = AB, if the body falls from B. This may be written $v^2 = 2g$. S . sin. a, or $= 2g$. AB . sin. a, or $= 2g$. BC, since AB . sin. a = BC. But this is the same as the velocity acquired by a body in falling freely through BC. In fact, it holds generally true, that the velocity acquired by a body falling down the surface of any smooth curve is that due to the vertical height through which it has fallen; which might be proved in various ways, but is sufficiently clear from this, that any curve may be considered as a succession of inclined planes, indefinitely short in length, and great in number; for the proposition being true, as above proved, for each of them, will be true for all, and therefore for the curve.



For an account of the variations of the value of g, due to the earth not being a perfect sphere, and other causes, see EARTH. The reader is also referred to the article ATWOOD'S MACHINE. The theory of the descent of bodies under gravity was first discovered and taught by Galileo.

FALLING SICKNESS. See EPILEPSY.

FALLMERAYER, JACOB PHILIPP, a German traveller and historian, was born 10th December 1791, at Tschotsch, near Brixen in the Tyrol; studied at Brixen, and in 1809 went to Salzburg, where he gave instructions to pupils in history and Latin. At the university of Landshut, he studied law, history, and philology. When Germany rose against Napoleon in 1813, he entered the Bavarian army, and took part in several engagements. After peace was concluded, F. returned to his studies. In 1826, he was appointed to the chair of history and philology at Landshut. In 1831, he accompanied the Russian general, Count Ostermann-Tolstoy, in a journey to the East, visiting Egypt, Palestine, Syria, Cyprus, Rhodes, Greece, Turkey, and Italy. During 1830—1840, he resided with Count Ostermann-Tolstoy at Geneva, and in the course of the next eight years twice revisited the East. The events of

1848 recalled him to Bavaria, and for a short time he sat as a deputy to the Frankfurt parliament, but since 1850 has lived privately in Munich. F. is a distinguished polyglott, and speaks a great number both of European and Oriental tongues. His principal works are, *Geschichte des Kaiserthums Trapezunt* (Münch. 1831), *Geschichte der Halbinsel Morea im Mittelalter* (2 vols., Stuttg. 1830—1836), and *Fragmente aus dem Orient* (2 vols., Stuttg. 1845). His views on the origin of the modern Greek language have excited the liveliest controversy both in Greece and elsewhere. A complete edition of F.'s works is at present (1861) appearing at Leipsic, entitled *Gesammelte Werke von Jakob Philipp Fallmerayer*.

FALLO'PIAN TUBES, THE (so called after Fallopius, who is usually, but incorrectly, regarded as their discoverer), or oviducts, are canals about four or five inches in length in the human subject, opening at their inner extremity into the upper angle of the uterus or womb, and at the other end, by a fringed funnel-shaped termination, into the cavity of the peritoneum. This fringed or fimbriated extremity at certain periods grasps the ovary, and receives the ovum, which is discharged by the rupture of the Graafian vesicle. See OVARY. The ovum usually passes along the Fallopian tubes into the uterus, where it is either impregnated by contact with one or more spermatozoa, or is absorbed. Sometimes, however, the ovum becomes not only impregnated but retained, and further developed in the Fallopian tubes, thus giving rise to one of the forms of extra-uterine pregnancy.

FALLO'PIUS, GABRIEL, a celebrated anatomist, born at or near Modena, about the year 1523 (this date, however, is very uncertain), and died in 1562. If the date we have assigned is correct, he was only twenty-five when he was promoted from the university of Ferrara to a professorship at Pisa, whence, after a few years, he was called to Padua, to succeed Vesalius, who had been compelled by the Inquisition to resign his office. See VESALIUS. Cuvier characterises him as one of the three *savants* who restored rather than created the science of anatomy in the 17th c., the two others being Vesalius and Eustachius. After a short but brilliant career, he died at the age of 40, and was succeeded by his favourite pupil, Fabricius ab Acquapendente.

He published numerous works in various departments of medicine, of which the most important is his *Observationes Anatomicæ, in libros quinque digestæ*, 1561, in which he corrects many errors into which his predecessor, Vesalius, had fallen. He was the first to describe with accuracy the ethmoid and sphenoid bones, and the minute structure of the ear (the canal along which the facial nerve passes, after leaving the auditory, is still known as the aqueduct of Fallopius); the muscles of the soft palate, and the villi and valvulæ conniventes of the small intestine. In some of his supposed discoveries, he had been long anticipated; for example, the tubes passing from the ovary on either side to the uterus, and which bear his name, were known to, and accurately described by, Herophilus and Rufus of Ephesus, 300 years before our era. In addition to his anatomical fame, he had a considerable reputation as a botanist. He was the superintendent of the botanical garden at Padua; and a genus of plants, *Fallopia*, has been named after him. A complete edition of his works, in four folio volumes, was published in 1600.

FALLOUX, FRÉDERIC ALFRED PIERRE, VICOMTE DE, a French author and statesman, was born at Angers 11th May 1811. His family was distinguished for its legitimist zeal, and at the Restoration was rewarded by receiving letters of nobility. Young F. first drew attention to himself by two works penetrated by an ardent love of the old Bourbon order of things—*L'Histoire de Louis XVI.* (Paris, 1840), and *L'Histoire de Saint Pie V., Pape, de l'Ordre des Frères prêcheurs* (Paris, 1844). These indicate the level of his political and religious faith. In the elections of 1846, he was chosen deputy for the department Maine-et-Loire. In religion, he advocated the ideas of Montalembert; in politics, those of Berryer, but united with his legitimist sentiments a love of liberty and education strangely incongruous with the historic character of his party. After the revolution of February 1848, he exhibited much energy as a member of the Constituent Assembly, was one of those who organised the resistance to the insurrection of the 15th May, and, as reporter on the national workshops, pronounced for their immediate dissolution. He was also one of the most ardent promoters of the expedition to Rome, which has since entailed so much trouble and even danger on the government of France. After the election of Louis Napoleon to the presidency, F. was appointed Minister of Public Instruction, an office which he held only for ten months. Since the events of the 2d December 1851, he has retired from public life altogether, to a country-seat in the neighbourhood of Angers, where he occupies himself with agricultural pursuits. In 1857, he was admitted a member of the French Academy, and in the same year published at Tours his *Souvenirs de Charité*.—F. has a brother, a canon at the court of Rome, who flatters himself that he possesses the veritable handkerchief of St Veronica, bearing the imprint of the Saviour's countenance.

FALLOW (from the same root as Ger. *fahl* or *falb*, Lat. *fulvus*, expressing a pale dun, tawny colour). This word sometimes signifies waste, untilled land; but usually it is applied to land that is ploughed and otherwise stirred for a season without being cropped. The most of the wheat raised by the Romans was sown after the land was fallowed; indeed, the usual rotation was fallow and wheat alternately. It was only fertile soils that could long support such an exhausting system; hence resulted the decreasing produce which the later Roman agricultural authors so often speak of and lament.

The fallowing of land was introduced into all the countries which fell under the dominion of the Romans. During their sway in Britain, it soon exported large quantities of wheat; and for centuries after the Romans left it, no other mode of cultivating the land was followed. It may here be observed, that wherever the system of fallowing, without giving manure to the crops, is practised, it necessarily supposes that the soil is at least moderately fertile. This system is most successful on argillaceous soils, which are retentive of organic manure. It must be borne in mind that the chief use of fallow is to liberate the plant-food which is already stored up in the soil as organic matter. The ploughing and stirring, by admitting air, promotes decomposition, in the same manner as the turning over of a dunghill does; it also destroys the roots of the weeds that impoverish and choke the crops.

It was long before fallowing was introduced to any extent in Scotland; but about the beginning of the present century, it was largely practised. Owing, however, to the draining of the soil, and the extension of the green-cropping system, it is now confined to the most retentive clay-soils, where it affords the only means of thoroughly cleaning the land. In a rotation of beans, clover, oats, fallow, wheat, and barley, each field is subjected to a process of fallowing once in every six, seven, or eight years, according to circumstances.

Fallow-fields usually receive a deep furrow in autumn. Lying exposed through the winter, the frost pulverises the surface. In spring, when the weather becomes dry, the cultivator or the plough opens up the soil, and the process of extirpating the weeds goes on. Sometimes as many as three or four furrows are given in summer before the seed is sown in autumn. In old cultivated countries, land is commonly so much reduced in its organic matter, that fallows receive dressings of farm-yard manure, rape-dust, or guano, to obtain fertility.

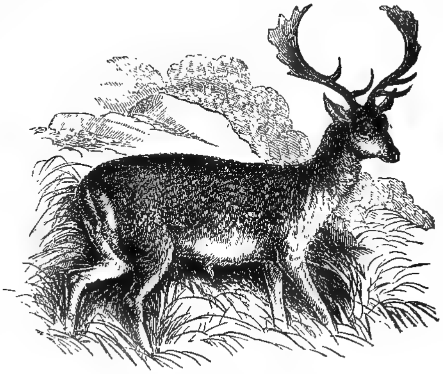
Since the general introduction of green crops, the term fallow has departed in some measure from its original meaning. These crops are sown on what was formerly the fallow-break, and are now often styled fallow-crops. The land, no doubt, receives in some measure a fallowing, as the green crops are cultivated by the plough during their growth. Bastard-fallowing is a term which is used in Scotland when hay-stubble is ploughed up in the end of summer, freed from weeds, and sown with wheat in autumn.

Where no express stipulation on the subject has been introduced into the lease, it has been held in Scotland, that, as the outgoing tenant might have taken a crop from the land, which, in accordance with the most approved principles of agriculture, he ought to leave fallow, and as the incoming tenant reaps the advantage in case of his abstaining from doing so, he is entitled to claim its value (Purves, December 3, 1822. See Bell's *Principles*, s. 1263). 'This decision,' says Mr Hunter (*Landlord and Tenant*, ii. p. 458), 'has been deemed to have fixed the law.' In conformity with the same principle, it has been ruled, that if the outgoing tenant received prepared fallow, the like should be left by him. A tenant who, on entering to his farm, had received a certain extent of fallow, prepared with manure, free of expense, was held bound to leave the same amount of fallow and manure as he had received, and to be entitled to claim payment only for the surplus (Brown *v.* College of St Andrews, 11th July 1851). But where a portion of land has been expressly reserved in the lease for fallow and green crop, for which the tenant was to receive merely a certain sum per acre for ploughing, the rights of the parties are settled by the contract, and the tenant can claim no additional sum for fallow (Sheriff *v.* Lord Lovat, 13th December 1854).

FALLOW CHAT. See Wheatear.

FALLOW DEER (*Dama vulgaris* or *Cervus Dama*), a species of deer well known in Britain, being very commonly kept in *parks*, as it is also in most parts of Europe. It is probably a native of the countries around the Mediterranean, and has been introduced by man into the more northern parts of Europe, where it is, however, now in some places to be found wild in forests. It is doubted whether it has not been introduced by man, at a remote period, from the North of Africa even into the south of Europe, in all parts of which it is now at least completely naturalised. How far its geographic range extends eastward, is not very certainly known. It is represented in the sculptures of Nineveh. Its introduction into Britain is ascribed to James VI. of Scotland, who is said to have brought it from Norway when he brought home his queen, Anne of Denmark, and after his accession to the English throne, to have transported it to Enfield and Epping. Thousands of F. D. now exist in some of the English parks. They generally receive some attention and supplies of fodder in winter.

In size, the F. D. is smaller than the stag or red deer, from which it also differs in its broad palmated antlers, its longer tail, and its smoother and finer hair. In colour, it is generally yellowish-brown in summer; darker, or even blackish-brown in winter; more or less spotted with pale spots, particularly in summer and when young; but in one variety the spots are very marked; in another dark-coloured variety they are not to be observed even in the young. The buttocks are always white, and a dark line passes along the back. The under parts are white. White F. D. are sometimes to be seen. The female has no horns. The male is called a Buck (Fr. *daim*), the female a Doe (Fr. *daime*), the young a Fawn (Fr. *faon*). The name F. D. is derived from its colour. See the article Fallow, in Agriculture.



Fallow Deer (*Cervus Dama*).

When the F. D. and red deer are kept in the same park, the herds seldom mingle, nor do hybrids occur. The F. D. loves the shelter of woods.

The flesh of the F. D. is one of the most esteemed kinds of venison.

The remains of fossil species nearly allied to the F. D. occur in some parts of Europe. Not remotely allied to it is the great fossil Irish *Elk* (q. v.).

FA'LMOUTH, a parliamentary and municipal borough and seaport in the south-west of Cornwall, on a west branch of the estuary of the Fal, 14 miles north-north-east of Lizard Point, and 269 miles west-south-west of London. It chiefly consists of a narrow street, a mile long, on the south-west of the harbour, and of beautiful suburban terraces and villas on the heights behind. The harbour, one of the best in England, is formed by the estuary of the Fal, which is 5 by 1 to 2 miles in extent. It is 12 to 18 fathoms deep, and affords shelter to 500 vessels at a time. The mouth is defended on the west by Pendennis Castle, situated on a rock 198 feet high, and which resisted a siege by Cromwell for six months; on the east, by Mawes Castle, both built by Henry VIII. Pop. (1861) 5706. With Penrhyn, it returns two members to parliament. In 1860, 1293 vessels, of 121,971 tons, entered and cleared the port. There is a great pilchard-fishery off the neighbouring coasts. The chief exports are tin, copper, pilchards, and fuel. Here orange and lemon trees yield plenty of fruit on open garden-walls. F. arose in the middle of the 17th c., Sir Walter Raleigh having at an earlier period drawn public notice to its capabilities, and it has been, since that time, a chief rendezvous for fleets and mail-packets proceeding to foreign countries.

FALSE, RULE OF, or **FALSE POSITION,** is a mode of reckoning in cases where a direct solution of the question is impracticable. Any number is chosen at hazard, as that which is sought; this *false position* of course gives a false result, and from the amount of the error, it is ascertained by proportion what the assumption ought to have been. *Ex.* What number is that whose half exceeds its third by 12? Assume 96 at random; 48 – 32 gives 16, which is too great; ∴ 16 : 12 :: 96 : 72, the number required. This method is now mostly superseded by the use of equations.

FALSE AND PRETENDED PROPHECIES, with intent to disturb the public peace, are punishable by several old statutes. By 33 Henry VIII. c. 14, this crime is made a felony; but by 3 and 4 Ed. VI. c. 15, continued by 7 Ed. VI. c. 11, and by 5 Eliz. c. 15, the punishment is restricted to one year's imprisonment, and forfeiture of £10 for the first offence; and for the second offence, imprisonment for life, and forfeiture of all chattels. These statutes apply to a particular class of prophecies—viz., prophecies 'upon or by the occasion of any arms, fields, beasts, badges, or such other like things accustomed in arms, cognizances, or signets; or upon or by reason of any time, year, or day, bloodshed, or war, to the intent to make rebellion, &c.' This description refers to predictions founded upon the heraldic bearings of particular families, which, in the state of public feeling at the time when the statutes were passed, might have been productive of discontent and sedition. The statutes are unrepealed, but are not likely in the present day again to be put in force.

FALSE BAY, an inlet which may be referred either to the Atlantic, the Southern, or the Indian Ocean. It washes the east side of the mountainous district of South Africa, which terminates in the Cape of Good Hope, and extends eastward along the coast as far as False Cape, measuring about 22 miles in length, and about the same in breadth. F. B. is, of course, sheltered from the north-west monsoon, to which Table Bay—the harbour of Cape Town—is exposed, an advantage which is more especially possessed by Simon's Bay, at its north-west extremity. Hence, besides periodically receiving trading-vessels from Cape Town for temporary protection, it is permanently the station of the naval force of the colony.

FALSE IMPRISONMENT. Every confinement of the person is an imprisonment, whether it be in a common prison or a private house, or in the stocks, or even by forcibly detaining one in the public streets (Coke, *Inst.* ii. 482). A man is liable for detaining the person of another, not only without cause, but without legal cause. Thus, where a man gives another in charge for committing an offence, the former is liable to an action for false imprisonment, if he fails to substantiate his case. Police-officers, also, are liable for apprehending a man without a competent warrant, or without reasonable suspicion. But where a felony has been committed, an officer is entitled to arrest on suspicion. Not only constables but private persons may arrest a man who commits a felony in their presence. A person who has falsely imprisoned another is liable to a criminal prosecution, and also to a civil action. In the former case, he may be punished by fine and imprisonment; in the latter, he must pay such damages as are awarded. Any one detained without sufficient cause is entitled to apply for a writ of *Habeas Corpus* (q. v.) to procure his liberation. In Scotland, this species of offence is called Wrongous Imprisonment (q. v.).

FALSE NEWS or **RUMOURS.** Spreading false news to make a discord between the sovereign and nobility, is a misdemeanour, and punishable by the common law of England with fine and imprisonment. By statute of Westminster the first, c. 34, this penalty is confirmed. This statute is said by Lord Coke to have been passed in consequence of the rebellion of Simon de Montfort (Coke, *Inst.* ii. 226). The law before the Conquest had been more severe, and required that the author and spreader of false rumours should have his tongue cut out, if he redeemed it not by estimation of his head (or capitation tax). One of the articles against Cardinal Wolsey was founded on this principle of common law. 'Also the said cardinal has busied and endeavoured himself by crafty and untrue tales against your nobles of your realm.'—Coke, *Inst.* iv. 92. The feeling of the present day is more in accordance with the axiom of Tacitus, *Convicia, si irasceris, tua divulgas, spreta excolescunt* (If you seek to revenge slanders, you publish them as your own; if you despise them, they vanish).

FALSE PRETENCES, OBTAINING MONEY BY. By the common law of England, a man is not punishable as a criminal who has induced another, by fraudulent representations, to part with the property of money or goods, unless the loss occasioned by the deception be of a public nature. Larceny or theft was the only species of wrongful abstraction of articles of value which was recognised, and where the consent of the owner to the transaction was obtained, no matter how fraudulently, the loser was left to a civil action for his relief. To remedy this defect in the law, the 33 Henry VIII. c. 1 was passed, whereby it was enacted, that if any person should falsely and deceitfully obtain any money, goods, &c., by means of any false token or counterfeit letter made in any other man's name, the offender should suffer any punishment short of death, at the discretion of the judge. This statute, however, only reached the case of deception by use of a false writing or token; the 30 Geo. II. c. 24 was therefore passed for the purpose of including all false pretences whatsoever. Further alterations were made by subsequent statutes, until, by 7 and 8 Geo. IV. c. 29, the previous legislation on the subject was consolidated. This is now the ruling statute in regard to false pretences. The general principle is that, wherever a person fraudulently represents as an *existing fact* that which is not an existing fact, and so gets money, &c., that is an offence within the act (Reg. *v.* Woolley, i. Den. C. C. 559). The false pretence must relate to some present fact, and therefore a promise merely to do some act is not such a false representation as will sustain a conviction. It is not necessary that the deception should be by words or writing, but any act tending to deceive, will bring a person within the statute. Thus, a man at Oxford wearing a cap and gown, in order to induce a tradesman, of whom he ordered goods, to believe that he was a member of the university, is sufficient to warrant a conviction. The deception practised, however, must not be simply as to the *quality* of an article, for this is regarded as merely a dishonest trick of trade, and not criminally punishable; it is also necessary that the owner should be deceived by the pretence; and where a tradesman is induced to part with goods to a regular customer, making a false statement, not on account of the statement, but from his belief in the credit of the party, the transaction is not punishable under the act. By 24, 25 Vict. c. 96, ss. 88—90, it is enacted that it shall be no bar to a conviction that the crime, on being proved, amounts to larceny, and that it shall not be necessary to prove an intent to defraud any particular person; that the delivery of money, &c., to another person, for the benefit of the party using the deception, and also the obtaining signature to, or destruction of, a valuable security, &c., by a false representation, shall subject the offender to punishment. The same statute, ss. 46 and 47, contains a salutary provision, that any person attempting to extort money by threatening to accuse another of certain felonies, or of an infamous crime, may be transported for life.

In Scotland, this offence is known as Falsehood, Fraud, and Wilful Imposition. Each species of the offence which in England is punishable under the statute, in Scotland is indictable at common law. Thus, false personation, as where a man, in the assumed character of an exciseman, received money as a composition for smuggled goods, has been held to warrant a conviction of falsehood. So, also, where the deception consists in fictitious appearances; as where a man, by fitting his shop with false bales, induced another to trust him with goods. Obtaining money by begging-letters, and the common practice of chain-dropping, fall under this denomination of crime.

FALSE RETURN, Action for. Where a sheriff makes a false return to a writ, the party injured may maintain an action against him for damages. Thus, a return of *non est inventus* to a writ of *capias*, when the defendant might have been apprehended, or a return of *nulla bona* to a *fieri facias*, when there were goods which might have been seized, renders the sheriff liable in damages to the amount of loss occasioned by his negligence.

FALSE SIGNALS. By 7 Will. IV. and 1 Vict. c. 89, s. 5, the exhibiting any false light or signal, with intent to bring any ship or vessel into danger, is made felony, and punishable with death. The felonious intent may be proved by declarations made by the accused, or by circumstances which fairly lead to the conclusion of a guilty purpose. The punishment of death is recorded, but is not in fact carried out.

FALSE SWEARING. By 19 and 20 Vict. c. 79, s. 178 (Bankruptcy, Scotland), any person guilty of falsehood in any oath made in the pursuance of the act, shall be liable to a prosecution at the instance of the Lord Advocate, or of the trustee in the sequestration, with consent of the Lord Advocate. But in the latter case, the prosecution must be authorised by a majority of the creditors present at a meeting called for the purpose. The person, on conviction, is liable, in addition to the punishment awarded, to forfeit, for behoof of the creditors, his whole claim under the sequestration. In England a bankrupt is not put upon oath; but on making a false declaration, he is deemed guilty of a misdemeanour and punishable with the penalty of perjury.

FALSE VERDICT. The remedy in cases where it was alleged that a false verdict had been returned, was formerly by means of a writ of attaint. This writ originally lay only in cases where the jury had returned a verdict on their own knowledge of the facts, and proceeded on the assumption that, in returning a false verdict, they were necessarily perjured. The case was heard before twenty-four men, and in case the original verdict was found bad, the jurors incurred the penalty of infamy and forfeiture of their goods. By statute of Westminster the first, c. 34, a writ of attaint was allowed upon an inquest; i. e., where cases had been decided upon evidence adduced. In this case, the evidence produced on the second inquiry could only be such as had been laid before the first jury, as it would have been manifestly unjust to punish jurors on fresh evidence which they had not heard. Writ of attaint was abolished by 6 Geo. IV. c. 50, s. 60.

FALSE WEIGHTS AND MEASURES. The use of false weights and scales is an offence at common law in England, and punishable by imprisonment. In Scotland, by 1607 c. 2, the users of false weights are punishable by confiscation of movables.

FALSEHOOD. See Fraud.

FA'LSET, or FALSE'TTO, a term in singing for the highest register of a man's voice, which joins the natural or chest voice, and which, by practice, may be so blended with the chest-voice as to make no perceivable break.

FALSIFY'ING RECORDS. The injuring or falsifying any of the documents of a court of justice is, by several modern statutes, made a serious offence. Any person obliterating, injuring, or destroying any record, writ, &c., or any original document belonging to any court of record or of equity, is guilty of a misdemeanour, and may be transported for seven years (now penal servitude), or be punished by fine or imprisonment, with or without hard labour, 7 and 8 Geo. IV. c. 29. By 13 and 14 Vict. c. 99, any person employed to furnish certified copies wilfully certifying any document as a true copy, knowing the same is not so, is guilty of a misdemeanour, and may be imprisoned for eighteen months. This act does not extend to Scotland. By 1 and 2 Vict. c. 94, any person employed in a public record office certifying any writing to be a true copy, knowing the same to be false in any material part, is guilty of felony, and may be transported for life.

FA'LSTER, a Danish island in the Baltic, south of Seeland, lies between lat. 54° 30′ and 54° 58′ N., and between long. 11° 45′ and 12° 11′ E. It is separated by the strait called the Grönsund from the island of Moen, and by that called the Guldborgsund from the island of Laaland, together with which F. forms the stift or province of Laaland, a province which contains in all 635 square miles, and which, in 1855, had 196,811 inhabitants. F. is about 26 miles long, and 16 wide at its widest part, and has an area of about 178 square miles. It is flat, remarkably fruitful, and well cultivated, so that it resembles an attractive garden, and maintains in all about 23,000 inhabitants, who employ themselves chiefly in agriculture and cattle-breeding. The chief town is Nykjöbing, on the Guldborgsund. It is very old, has a castle and a cathedral, has some commerce and shipbuilding, and a population of 2608. The only other place of any note is Stubbekjöbing.

FA'LUN, or FAHLUN (called also *Gamla Kopparberget*, i. e., the 'old copper-mine'), is a town of Sweden, capital of the län, or province, of the same name, formerly the province of Dalecarlia. It stands on the north-western shore of Lake Runn, 120 miles north-west of Stockholm, and has long been, and still is, famous for its copper-mines, though the quantity of ore now obtained from them is much smaller than formerly. The greatest yield was about 1650, when no less than 3000 tons were annually got; this, however, declined, in 1690, to 1900 tons; while at present it is only about 400 tons. Gustavus Adolphus used to call the mines the 'treasury of Sweden.' The excavations are immense, extending for miles underground, and containing vast chambers, where Bernadotte, the late king of Sweden, gave splendid banquets, on which occasions the mines were brilliantly lighted up. F. is an old town, regularly built, but has on the whole a gloomy effect, as its houses, which are of wood, have become blackened by the fumes which arise from the numerous smelting-furnaces of the town. These fumes, though destructive to all vegetable life in the neighbourhood, do not seem to affect the health of the inhabitants; on the contrary, it is resorted to for safety during the prevalence of contagious diseases. F. has a High School founded by Queen Christina, a museum, an institution for instruction in the science of mining, several cotton and flax-spinning mills, and some manufactures of blankets and carpets—which are made from cow-hair—tobacco-pipes, leather, &c. Pop. 4618.

FALUNS, a term given by the agriculturists of Touraine to shelly sand and marl, which they spread over their lands as a fertilising manure, and employed by geologists as the name of the deposits from which those materials are obtained. They are loosely aggregated beds of sand and marl, in which are shells and corals, some entire, some rolled, and others in minute fragments; occasionally, they are so compacted by calcareous cement as to form a soft building-stone. They occur in scattered patches of slight thickness in the lower part of the valley of the Loire. The animal remains contained in them are chiefly marine, and have the stamp of a more tropical fauna than the Mediterranean. A few land and fluviatile mollusca are found mixed with the oceanic forms, and with these are associated the remains of terrestrial quadrupeds, as Dinotherium (q. v.), Mastodon (q. v.), Rhinoceros (q. v.), &c. It is probable that the falun-beds were deposited near the shore in shallow water, and at a time when the temperature was warmer than it is now. About 25 per cent. of the organic remains are said to belong to recent species. The strata form the typical beds of Lyell's Miocene Period (q. v.), the middle division of the Tertiary rocks.

FA'MA (Gr. *Pheme*), the goddess of rumour, appears in the works of the earliest poets. Sophocles makes her the child of Hope; Virgil, the youngest daughter of Terra, the sister of Enceladus and Cœus. Terra produced her to avenge herself upon the gods for the defeat of her sons the giants, as F. would everywhere proclaim their evil deeds. Ovid describes her dwelling as a palace of sounding brass with a thousand entrances.

FA'MA CLAMO'SA, in the ecclesiastical law of Scotland, is a wide-spread report, imputing immoral conduct to a clergyman, probationer, or elder of the church. A fama clamosa, if very clamant, may form the ground of process by a presbytery, without any specific complaint being brought before them, or there being any particular accuser. In these circumstances, the presbytery act for the vindication of their own order, and in behalf of the morals of the community. Should the inquiries of the presbytery lead them to the conviction that the rumour is not without foundation, they will serve the accused party with a libel, and thus bring him for trial before them. (Hill's *Church Prac.* 49; Cook's *Styles;* and Wood *On Libels.*)

FAMI'LIAR SPIRITS, a term employed to denote certain supernatural beings, in attendance upon magicians, wizards, witches, conjurors, and other skilful professors of the black art. The word 'familiar' is in all likelihood derived from the Latin *famulus* (a 'domestic,' a 'slave'). The belief in such spirits goes far back into the history of the race. We read of them in the time of Moses, who admonishes his countrymen to 'regard not them that have familiar spirits' (Lev. xix. 31), which would imply the prevalence of the superstition among the Egyptians. The word in the original rendered 'familiar spirits' is *oboth;* it is of frequent occurrence in the Hebrew Scriptures, and literally signifies 'leathern bottles;' thereby indicating the antiquity of the idea, that magicians were wont to imprison in bottles the spirits whom their spells had subdued (whence our 'bottle-imps' and 'bottle-conjurors'); the origin, again, of which grotesque belief is perhaps to be sought for in the circumstance that mystical liquids kept in vials have been immensely in vogue among the conjurors of all ages and countries. It is not clear, as some think, that we can include Socrates among those who shared this vulgar superstition, for although he spoke of his attendant 'dæmon' in very ambiguous terms, the opinion of all enlightened critics is, that he meant by the word nothing more and nothing less than what Christians mean by the presence of a divine light and guide in the heart and conscience. But according to Delrio—a great authority on this subject—the belief in familiar spirits in the grosser and more magical form did exist among the ancient Greeks, who, he affirms, designated such beings *Paredrii*, 'companions,' as being ever assiduously at hand. The story of the ring of Gyges, king of Lydia, as narrated by Herodotus, is held by Heywood (see *Hierarchie of the Blessed Angels*, &c.) to prove the existence of the belief in that country also; and it is quite certain that during the middle ages the belief in 'enchanted rings' containing familiar spirits was widely diffused throughout Europe, the magicians of Salamanca, Toledo, and those of Italy, being especially famous for their skill in thus subjugating and imprisoning demons. Asia, in fact, would seem to have been the original home of the belief in familiar spirits, which has long been established as a cardinal superstition of the Persians and Hindus, and which appears in perfection in the *Arabian Nights*. The 'slave of the lamp' who waits upon Aladdin is an example in point. Whether the belief in familiar spirits sprung up independently among the nations of Western Europe, or was transplanted thither by intercourse with the East, does not clearly appear. A favourite form assumed by the familiar spirit was that of a black dog. Jovius and others relate, that the famous Cornelius Agrippa (q. v.), half philosopher, half quack, was always accompanied by 'a devil in the shape of a black dog;' and add, that when he perceived the approach of death, he took a collar ornamented with nails, disposed in magical inscriptions, from the neck of this animal, and dismissed him with these memorable words: *Abi, perdita Bestia, quæ me totum perdidisti*—('Away, accursed beast, who hast ruined me wholly for ever'). Butler, in his *Hudibras*, speaks highly of this animal:

> Agrippa kept a Stygian pug
> I' the garb and habit of a dog
> That was his tutor, and the cur
> Read to the occult philosopher,
> And taught him subtly to maintain
> All other sciences are vain.

The readers of Goethe, too, will remember that Mephistopheles first appears to Faust and Wagner during their evening walk in this shape; but, in truth, the earliest instances of such transmigration are much older at least, if medieval tradition can be credited, for it assures us that Simon Magus and other ancient magicians had familiar spirits who attended them in the form of dogs. Curiously enough, in spite of the servitude to which the attendant imps were reduced by the potent spells of the magicians, they were popularly supposed, during the middle ages, to have their revenge at last, by carrying with them into eternal torment the souls of their deceased masters. This idea of divine retribution overtaking the practisers of magic is, however, not found *out* of Christendom. The Jews think not the less but the more of Solomon because he was, as they say, one of the greatest of magicians; and a similar feeling in regard to 'wonder-workers' pervades eastern nations generally, though it is to be noticed that the latter are often represented as using their power malignantly. See MAGIC.

FAMILIARS. See INQUISITION.

FA'MILY (Lat. *familia*). Though we are in the habit of regarding the life of antiquity, and more particularly that of Greece, as less domestic than that of Christian Europe (and probably with reason), the idea of the family or house (Gr. *oikós*), as the nucleus of society, as the political unit, was there very early developed. Aristotle speaks of it as the foundation of the state, and quotes Hesiod to the effect that the original family consisted of the wife and the labouring ox, which held, as he says, to the poor the position of the slave (*Polit.* i. 1). The complete Greek family then consisted of the man and his wife and his slave; the two latter, Aristotle says, never having been confounded in the same class by the Greeks, as by the barbarians (*Ib.*). In this form, the family was recognised as the model of the monarchy, the earliest, as well as the simplest, form of government. When, by the birth and growth of children, and the death of the father, the original family is broken up into several, the heads of which stand to each other in a co-ordinate rather than a strictly subordinate position, we have in these the prototypes of the more advanced forms of government. Each brother, by becoming the head of a separate family, becomes a member of an aristocracy, or the embodiment of a portion of the sovereign power, as it exists in the separate elements of which a constitutional or a democratic government is composed.

But at Rome the idea of the family was still more closely entwined with that of life in the state, and the natural power of the father was taken as the basis not only of the whole political, but of the whole social organisation of the people. In its more special aspects, the Roman idea of the family will be explained under PATRIA POTESTAS. Here it will be sufficient to state that with the Romans, as with the Greeks, it included the slave as well as the wife, and ultimately the children; a fact which indeed is indicated by the etymology of the word, which belongs to the same root as *famulus*, a slave. In its widest sense, the *familia* included even the inanimate possessions of the citizen, who, as the head of a house, was his own master (*sui juris*); and Gaius (ii. 102) uses it as synonymous with *patrimonium*. In general, however, it was confined to persons—the wife, children, grandchildren, and great-grandchildren, if such there were, and slaves of a full-blown Roman citizen. Sometimes, too, it signified all those who had sprung from a common stock, and would have been members of the family, and under the potestas of a common ancestor, had he been alive. See COGNATI. In this sense, of course, the slaves belonging to the different members of the family were not included in it. It was a family, in short, in the sense in which we speak of 'the royal family,' &c., with this difference, that it was possible for an individual to quit it, and to pass into another by adoption. See ADOPTIO. Sometimes, again, the word was used with reference to slaves exclusively, and, analogically, to a sect of philosophers, or a body of gladiators. See Smith's *Dictionary of Greek and Roman Antiquities*.

The whole social fabric is based on the grouping of human beings in families; an arrangement which is in harmony with all the conditions and wants of human life, and which tends to foster those habits and affections that are essential to the welfare of mankind. A prosperous community must be an aggregate of happy families; there being little true happiness in the world that is not intimately connected with domestic life. The formal bond of the family is Marriage (q. v.; see also POLYGAMY); and an essential condition of its right development seems to be a distinct abode, which shall be not a mere shelter, but a house or *home*, affording a certain measure of comfort and decency, according to the standard prevalent in the community. See *Genius and Design of the Domestic Constitution*, by Rev. Christopher Anderson (Edin. 1826).

FAMILY OF LOVE. See AGAPEMONE.

FA'MINE, PORT, an abortive settlement of Spain, on the northern side of the Strait of Magellan, is situated in lat. 53° 38′ S., and long. 70° 58′ W. It owes its name to the death, by starvation, of the Spanish garrison; and it is said to be now a penal colony of the republic of Chili. Some voyagers, however, have spoken of the neighbourhood as 'covered with flowers,' and 'decorated with luxuriance,' and capable of being made, so far as soil is concerned, 'one of the finest regions in the world.'

FAN, an instrument or mechanical contrivance for moving the air for the sake of coolness, or for winnowing chaff from grain. In the East, the use of fans is of remote antiquity. The Hebrews, Egyptians, Chinese, and the miscellaneous population of India, all used fans as far back as history reaches. At the present day, it is customary, in the better classes of houses in India, to suspend a large species of fan from the ceiling, and keep it in agitation with strings, pulled by servants, in order to give a degree of coolness to the air. See PUNKAH. Among the oldest notices of winnowing fans are those in the Scriptures. There the fan is always spoken of as an instrument for driving away chaff, or for cleansing in a metaphorical sense; and such notices remind us of the simple processes of husbandry employed by a people little advanced in the arts. It was a long stride from the use of a simple hand-instrument for winnowing to that of the modern mechanism employed for a similar purpose. See FANNERS.

As is observable from the collection of Egyptian antiquities in the British Museum, the fan as an article of female taste and luxury is of quite as old date as the instrument is for commoner purposes. Terence, a writer of Latin comedies, who lived in the 2d c. B.C., makes one of his characters speak of the fan as used by ladies in ancient Rome: *Cape hoc flabellum, et ventulum huic facito*—'Take this fan, and give her thus a little air.' From this Roman origin, the fashion of carrying fans could scarcely fail to be handed down to the ladies of Italy, Spain, and France, whence it was in advanced times imported by the fair of Great Britain. Queen Elizabeth, when in full dress, carried a fan. Shakspeare speaks of fans as connected with a lady's 'bravery' or finery:

> With scarfs and fans, and double charge of bravery.

It is proper to say, however, that the fan was in these and also in later times not a mere article of finery. There were walking as well as dress fans. The walking or outdoor fan which a lady carried with her to church, or to public promenades, was of large dimensions, sufficient to screen the face from the sun, and answered the purpose of the modern Parasol (q. v.). In old prints, ladies are seen carrying these fans in different attitudes according to fancy. The dress fan, which formed part of a lady's equipment at court ceremonies, drums, routs, and theatrical entertainments, was of a size considerably less than the walking fan, and altogether more elegant. Of these dress fans there exist numerous specimens bequeathed as heirlooms from one generation to another; indeed, there are few ladies who cannot shew several of different eras throughout the 18th c.; some being in good preservation, while in others the gilded stars and cupids which delighted the eyes of great-grandmothers have a mournfully tarnished appearance. In the finer kinds of these old fans, the open part of paper is painted with pretty rural scenes and groups of figures in the style of Watteau (q. v.). All were probably of French manufacture. The more costly fan imported from China was and still is altogether of ivory, highly carved and pierced; but it wants the lightness and flexibility which were essential in the ordinary management of this article of the toilet. Strictly speaking, the fan was used less for the purpose of cooling than for giving the hands something to do, and also for symbolically expressing certain passing feelings. In the hand of an adept, the fan, by peculiar movements, could be made to express love, disdain, modesty, hope, anger, and other emotions. Gay, speaking of Flavia's accomplishments, says:

In other hands, the fan would prove
An engine of small force in love.

Considering the coarseness of language, even in the higher circles, in the early part of the 18th c., we cannot wonder that the fan should have been indispensable to a lady going into company. It was held up to shield the countenance when anything too shocking for female ears was uttered. Pope has an allusion to this use of the fan

The modest fan was lifted up no more,
And virgins smiled at what they blushed before.

Steele, in a paper in the *Tatler*, No. 52, August 9, 1709, gives an amusing account of Delamira, a fine lady, resigning her fan when she was about to be married. One of her female acquaintances, having envied the manner in which this charming and fortunate coquette had played her fan, asks her for it. Delamira acknowledges the wonderful virtues of the fan, and tells her that 'all she had above the rest of her sex and contemporary beauties was wholly owing to a fan (that was left her by her mother, and had been long in the family), which, whoever had in possession, and used with skill, should command the hearts of all her beholders; "and since," said she smiling, "I have no more to do with extending my conquests or triumphs, I will make you a present of this inestimable rarity."' Two years later, Addison, in a paper in the *Spectator* (No. 102), gives a humorous account of the tactics of coquettes in the use of fans: 'Women are armed with fans as men with swords, and sometimes do more execution with them;' then he goes on to describe how ladies are instructed to handle, discharge, ground, and flutter their fans—the whole being a pleasant satire on the fan-manœuvring in the reign of Queen Anne.

Later in the 18th c., fans served another important purpose. At dancing assemblies in London, Bath, and elsewhere, it was usual for the gentlemen to select their partners by drawing a fan. All the ladies' fans being placed promiscuously in a hat, each gentleman drew one, and the lady to whom it belonged was his allotted partner. Mrs Montagu, in one of her letters, refers to this custom: 'In the afternoon, I went to Lord Oxford's ball at Mary-le-bone. It was very agreeable. The partners were chosen by their fans, but with a little *supercherie*.' Of the trick or fraud which this authoress delicately veils under a French term, the beaux of that period were far from guiltless. A lady's fan was almost as well known as her face, and it was not difficult, with a little connivance, to know which to draw. At Edinburgh, where it appears to have been the practice to select a partner for a whole season, the fans of the ladies were carefully studied. Sir Alexander Boswell alludes to this species of stratagem in one of his poems:

Each lady's fan a chosen Damon bore,
With care selected many a day before;
For unprovided with a favourite beau,
The nymph, chagrined, the ball must needs forego.

In Italy, Spain, the West Indies, and also some parts of the United States, fans are largely in use for giving the sensation of coolness during hot weather, and for this purpose they may sometimes be seen in the hands of gentlemen as well as ladies. In Spain, the old fashion of fan-flirting appears to be still in vogue. A late traveller in that country says: 'I was vastly interested in the movements of the ladies' fans at church. All the world knows that Spanish fans are in perpetual motion, and betray each feeling, real or assumed, that passes through the mind of the bearer. I felt convinced I could guess the nature of the service at every particular moment by the way in which the fans were waving. The difference between a litany and a thanksgiving was unmistakable; and I believed that minuter shades of devotion were also discoverable.' —*Vacation Tourists* (1861).

With other changes in manners, fans are no longer used in English fashionable circles for the frivolous purposes noticed in their past history; they still continue, however, to form an article of ceremonial dress at dinner and other evening parties. In embellishing them, foreign as well as native art is exerted on a scale commensurate with their price. From the superior kinds, composed of ivory and silk, costing twenty guineas, down to those of wood and paper, which are sold at 1*s*., there are varieties to suit every toilet and pocket. Lately, fans made tastefully of feathers, also fans constructed of straw and variously coloured ribbons, have been among the novelties of fashion. In the case of a general court mourning, ladies are enjoined to use 'black paper fans.' The manufacture of fans of various kinds is carried on in England, France, Belgium, Spain, and other European countries, likewise in the United States; and now, as formerly, the fan is an article of export from China to many parts of the world. W. C.

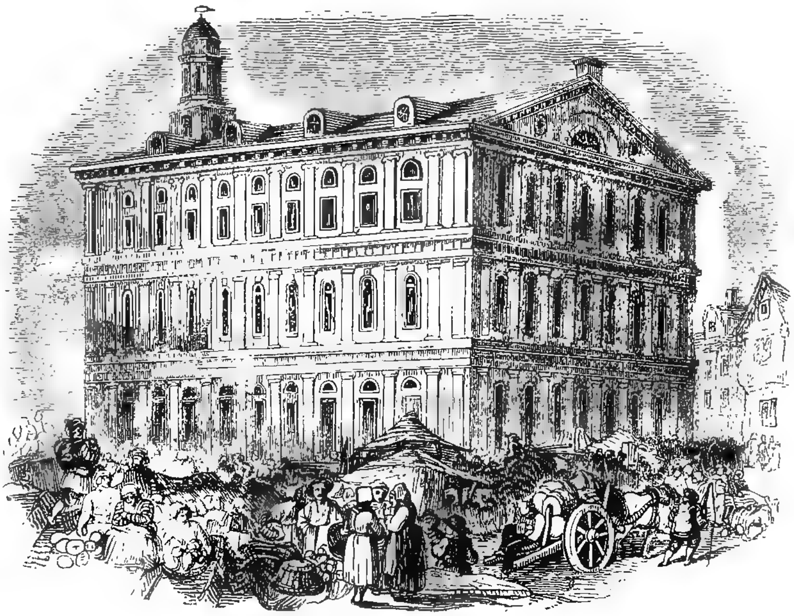
FAN PALM, a name common to all those palms which have fan-shaped leaves, as the species of *Mauritia*, *Lodoicea* (Double Cocoa Nut), *Hyphæne* (Doum Palm), *Corypha*, *Livistona*, *Chamærops*, &c. The only truly European palm, *Chamærops humilis* (q. v.), is a F. P., as is also the North American Palmetto. The Talipot Palm (*Corypha umbraculifera*) is sometimes called the Great Fan Palm. The Palmyra Palm is another fan palm. The fan-shaped leaf is produced by an abbreviation of the midrib of a pinnated leaf.

FANA'RIOTS, the general name given to the Greeks inhabiting the Fanar or Fanal in Constantinople, a quarter of the city which takes its name from the beacon (Gr. *phanarion*) situated in it. They first appear in history after the taking of Constantinople by the Turks, and appear to have been originally descendants of such noble Byzantine families as escaped the fury of the barbarians. Afterwards, however, the class was recruited by emigrants from different parts of the old Byzantine empire. Subtle, insinuating, intriguing, they soon took advantage of the ignorance of the Turkish governors, and made themselves politically indispensable to their rulers. They filled the offices of dragomans, secretaries, bankers, &c. One of them, named Panayotaki, at a later period, was appointed Dragoman to the Divan, and his successors obtained still greater honours. Through their influence, the lucrative office of Dragoman of the Fleet was called into existence, which gave them almost unlimited power in the islands of the Archipelago. Besides, from them were chosen, until the outbreak of the revolution in 1822, the Hospodars of Wallachia and Moldavia, while, in addition, the disposal of most of the civil and military posts under the Turkish government was in their hands. In spite of their power, however, the F. never exhibited much patriotism; they were animated by the petty motives of a caste, and when the war of liberation broke out among their countrymen, they took no part in it. In the present altered state of affairs in Turkey, they have no political influence. See Marco Zalloni's *Essai sur les Fanariots* (Marseille, 1824; 2d ed. 1830). Consult also Finlay's *History of the Greek Revolution* (Edin., Blackwood and Sons, 1861).

FANCY. See IMAGINATION.

FANDA'NGO, like the *Bolero*, is an old Spanish national dance, in $\frac{3}{4}$ time. It is danced most gracefully in the country, usually to the accompaniment of a guitar, while the dancers beat time with castanets, a custom borrowed from the Moors. It proceeds gradually from a slow and uniform to the liveliest motion; and notwithstanding the simplicity of the *pas*, vividly expresses all the graduations of the passion of love, in a manner sometimes bordering on licentiousness. The people are so passionately fond of it, that the efforts of the clergy have never been able to suppress it.

FANEUIL HALL, a spacious public hall in Boston, Massachusetts, erected in 1742 by Peter Faneuil, and presented by him to the town. In its original condition as so gifted, the building contained a hall for public meetings, with lesser apartments above, and a basement used as a market. In 1761, it was destroyed by fire, and rebuilt. During the revolutionary struggle with England, the hall was so often used for important political meetings, that it became known as 'the cradle of American liberty.' In 1805, the building was increased in height by an additional story, and also increased in width. It is now an edifice about 80 feet square; the hall contains some fine paintings; and the basement is no longer used as a market. The cut here given, which is taken from an original drawing, represents this interesting historical edifice as it existed in 1768.



Faneuil Hall.

FANFARE is the French name of a short and lively military air or call, executed on brass instruments. It was brought by the Arabs into Spain, whence it passed into Mexico and the New World. *Fanfaron*, derived from fanfare, is the name given to a swaggering bully or cowardly boaster, probably because of the empty noise he makes when 'blowing his own trumpet,' or threatening timid people, and the term applied to his idle braggadocia and vapouring vaunts is *Fanfaronnade*.

FANG (Ang.-Sax. and Ger., anything caught or taken, from the verb *fangen*, to catch). In the terminology of the law of Scotland, a thief taken *with the fang* is one apprehended while carrying the stolen goods on his person. It is not very long since this word formed part of the common speech of Scotland:

> Snap went the shears, then in a wink,
> The *fang* was stowed behind a bink.'
> *Morison's Poems*, p. 110.

In England, also, the verb *fang* was still in use in Shakspeare's time: 'Destruction *fang* mankind!' (*Timon of Athens*, iv. 3); and 'Master Fang,' in *Henry IV.*, is named after his office. We still use the phrase 'in the fangs,' for in the clutches; and the fangs of a dog or of a serpent are its teeth with which it catches or holds.

FANNERS, a machine employed to winnow grain. In passing through the machine, the grain is rapidly agitated in a sieve, and falling through a strong current of wind, created by a rotatory fan, the chaff is blown out at one end, and the cleansed particles fall out at an orifice beneath. The apparatus is composed chiefly of wood, and though ordinarily moved by the hand, it is sometimes connected with the driving power of a thrashing-mill. The fanners superseded the old and slow process of winnowing, which consisted in throwing up the grain by means of sieves or shovels, while a current of wind, blowing across the thrashing-floor, carried away the chaff. 'A machine for the winnowing of corn was, as far as can be ascertained, for the first time made in this island by Andrew Rodger, a farmer on the estate of Cavers in Roxburghshire, in the year 1737. It was after retiring from his farm to indulge a bent for mechanics, that he entered on this remarkable invention, and began circulating what were called *Fanners* throughout the country, which his descendants continued to do for many years.'—*Domestic Annals of Scotland*, by R. Chambers, vol. iii. Strangely enough, there was a strong opposition to the use of this useful instrument; the objectors being certain rigid sectaries in Scotland, who saw in it an impious evasion of the Divine will. To create an artificial wind, was a distinct flying in the face of the text, 'He that formeth the mountains, and createth the wind.'—Amos iv. 13. Apart from the folly of the objectors, who carried their fancies to the extent of petty persecution, we are amazed at their apparent neglect of the fact, that the winnowing of corn by artificial means, in which fans performed a conspicuous part, is mentioned repeatedly in the Old Testament. See FAN. The advantages in using the fanners soon overcame all prejudices on the subject, and the objections to the use of the machine are now remembered only by tradition, and by a passage in one of the imperishable fictions of Scott. In the tale of *Old Mortality*, Mause Headrigg is made anachronously to speak to her mistress about 'a newfangled machine for *dighting* the corn frae the chaff, thus impiously thwarting the will o' Divine Providence, by raising wind for your leddyship's use by human art, instead of soliciting it by prayer, or patiently waiting for whatever dispensation of wind Providence was pleased to send upon the shieling-hill.'

FA'NO (Lat. *Fanum Fortunæ*, so called from the temple of Fortune which the Romans erected here in commemoration of the defeat of Asdrubal on the Metaurus) is the name of a town and seaport of Italy, in the province of Urbino e Pesaro, finely situated in a beautiful and fertile district on the shore of the Adriatic, 30 miles north-west of Ancona, and near the mouth of the Metaurus. It is well built, is surrounded with walls and ditches, has a cathedral dedicated to St Fortunato, and numerous churches containing many valuable paintings, among which are several of the best works of Domenichino, and an excellent 'Annunciation' by Guido. The remains of a triumphal arch of white marble, raised in honour of Augustus, form perhaps the chief object of classical interest at Fano. Pop. 8960, who carry on considerable trade in corn and oil, and in silk goods. Here, in 1514, Pope Julius II. established the first printing-press with Arabic letters known in Europe. The port of F. was once well known to the traders of the Adriatic; its commerce, however, has declined, and the harbour become, to some extent, choked up with sand.

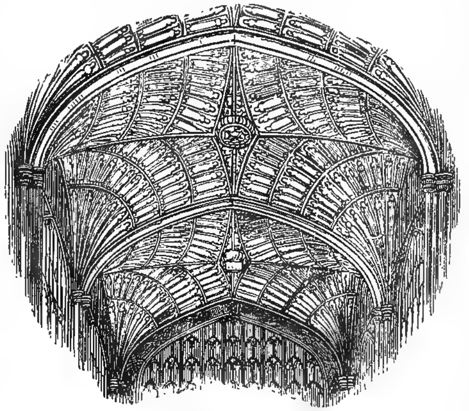
FANS, THE, a race of aborigines in Equatorial Africa, residing on the tributaries of the Gaboon river, and said to be cannibals; the accounts of this savage race are, however, still imperfect, and what is mentioned respecting them wants confirmation.

FANSHAWE, SIR RICHARD, was born in 1608 at Ware Park, in the county of Hertford; studied at Jesus College, Cambridge; and in 1626, became a member of the Inner Temple. On the outbreak of the civil war, he took part with the king; and in 1648, became treasurer to the navy under Prince Rupert. He was taken prisoner at the battle of Worcester; and on his release, withdrew to Breda in Holland, where Charles II. was holding his court in exile. After the Restoration, he was appointed ambassador at the court of Madrid, where he died in 1666. F. was an author of considerable reputation. His most celebrated work, now very rare, is a translation of Guarini's *Pastor Fido*, the lyrical passages of which are rendered with remarkable skill and elegance. The volume in which it appeared was published in 1664, and contains other pieces in prose and verse.

FANTA'SIA, in Music, the name of a composition of a similar character to the capriccio; also given to extempore effusions performed by a musician who possesses the rare gift of producing, as it were, off-hand music like a well-studied, regular composition. Hummel was more celebrated for his extempore fantasias on the pianoforte than even for his published compositions. Frederick Schneider was equally great for his free fantasias on the organ.

FANTOCCI'NI. See PUPPET.

FAN-TRACERY VAULTING, a kind of Late Gothic vaulting (15th c.), so called from its resemblance to a fan. The ribs or veins spring from one point, the cap of the shaft, and radiate with the same curvature, and at equal intervals, round the surface of a curved cone or polygon, till they reach the semicircular or polygonal ribs which divide the roof horizontally at the ridge level. The spaces between the ribs are filled with foils and cusps, resembling the tracery of a Gothic window; hence the name *fan-tracery*. The spaces between the outlines of the fans at the ridge level, are called by Professor Whewell (*German Churches*) ridge lozenges. In Henry VII.'s Chapel, Westminster, one of the best examples of this kind of vaulting, these lozenges are occupied by pendants, which produce a most astonishing effect, looking like arches resting on



Fan-tracery:
From King's College Chapel, Cambridge.

nothing. They are, however, supported with great ingenuity by internal arches, rising high above the visible vaulting. This is one of the *tours-de-force* which astonish the vulgar, but are only adopted when art has reached a low level, and has in a great measure given place to artifice. Fan-tracery is a very beautiful kind of vaulting, and is peculiar to England, where it originated, and where alone it was practised. Among the finest examples are Henry VII.'s Chapel at Westminster; St George's, Windsor; and King's College Chapel, Cambridge. Fan-tracery is also frequently used in the vaulting of cloisters, as at Canterbury, Chester, &c.

FA'RADAY, Michael, D.C.L., 1832, one of the most distinguished chemists and natural philosophers now living; a splendid instance of success obtained by patience, perseverance, and genius, over obstacles of birth, education, and fortune. He was born in 1794, near London, his father being a blacksmith. He was early apprenticed to a bookbinder; yet even then he devoted his leisure time to science, and amongst other things, made experiments with an electrical machine of his own construction. Chance having procured him admission, in 1812, to the chemical lectures of Sir H. Davy (q. v.), then in the zenith of his fame, he ventured to send to Davy the notes he had taken, with a modest expression of his desire to be employed in some intellectual pursuit. Davy seems to have at first endeavoured to discourage him, but finding him thoroughly in earnest, soon engaged him as his assistant at the Royal Institution. He travelled with Davy to the continent, as assistant and amanuensis. On their return to London, Davy confided to him the performance of certain experiments, which led in his hands to the condensation of gases into liquids by pressure. Here he first shewed some of that extraordinary power and fertility which have rendered his name familiar to every one even slightly acquainted with physics, and which led to his appointment, in 1827, to Sir H. Davy's post of Professor of Chemistry in the Royal Institution. We shall give a brief summary of his more important discoveries and published works, arranging the different subjects according to their position in various branches of science, rather than in their chronological order.

In chemistry, we have his treatise on *Chemical Manipulation*, 1827; 2d ed. 1842, even now a very valuable book of reference. His *Lectures on the Non-metallic Elements*, and *Lectures on the Chemical History of a Candle*, delivered at the Royal Institution, were published within the last few years. As discoveries or investigations of a high order in this branch of science, we may mention—New Compounds of Chlorine and Carbon, 1821; Alloys of Steel, 1822; Compounds of Hydrogen and Carbon, 1825; Action of Sulphuric Acid on Naphthaline, 1826; Decomposition of Hydrocarbons by Expansion, 1827; and the very valuable series of experiments made in 1829—1830, on the Manufacture of Glass for Optical Purposes, which resulted in one of his greatest discoveries, to be afterwards mentioned.

As practical applications of science, his Preparation of the Lungs for Diving, and Ventilation of Light-house Lamps, are conspicuous, as are also his celebrated letter on Table-turning, and his lecture on Mental Education.

To enumerate only the most prominent of his publications on physical science, we may commence with the Condensation of the Gases (already referred to); then we have Limits of Vaporisation, Optical Deceptions, Acoustical Figures, Regelation, Relation of Gold and other Metals to Light, and Conservation of Force. Of these, the condensation of gases into liquids and solids, though previously effected by others (and F. has ever been the foremost to acknowledge another's priority), he has really made his own, not only by the extent and accuracy of his experiments, but by the exquisite experimental methods by which he effected the results. His ideas on regelation, and its connection with the motion of glaciers, have not met with universal acceptance, though (see Heat, Ice, Glacier) there is no dispute as to his being correct in his *facts*. In regard to Conservation of Force, there can be no doubt that he has been led into a fallacy, by mistaking the technical use of the word *force* (see Force), for in his article on the subject he describes experiments made with the view of proving the conservation of *statical*, not *dynamical* force, whereas the doctrine of conservation asserts merely the conservation of 'energy,' which is *not* statical force. He *may* be right also, but if so, it will be by a new discovery, having no connection whatever with 'conservation of energy.'

His Christmas lectures at the Royal Institution, though professedly addressed to the young, contain in reality much that may well be pondered by the old. His manner, his unvarying success in illustration, and his felicitous choice of expression, though the subjects are often of the most abstruse nature, are such as to charm and attract all classes of hearers. Besides two sets (already mentioned) on chemical subjects, we have his *Lectures on the Physical Forces*, a simple work, but in reality most profound, even in its slightest remarks.

But the great work of his life is the series of *Experimental Researches on Electricity*, published in the *Philosophical Transactions* during the last thirty years and more. Fully to understand all the discoveries contained in that extraordinary set of papers, would require a knowledge of all that has been discovered during that time as to Electricity, Magnetism, Electro-magnetism, and Diamagnetism. We may merely mention the following, almost all of which are discoveries of the *first* order. They are given in the order of publication, which is nearly that of discovery: 1. Induced Electricity, 1831, comprehending and explaining a vast variety of phenomena, some of which have already been applied in practice (especially as Magneto-electricity) to light-houses, electro-plating, firing of mines, telegraphy, and medical purposes. Electric currents derived from the earth's magnetism. 2. The Electrotonic State of Matter, 1831; 3. Identity of Electricity from Different Sources, 1833; 4. Equivalents in Electro-chemical Decomposition, 1834; 5. Electrostatic Induction—Specific Inductive Capacity, 1838; 6. Relation of Electric and Magnetic Forces, 1838; 7. The Electricity of the Gymnotus, 1839; 8. Hydro-electricity, 1843; 9. Magnetic Rotatory Polarisation, 1846, effected by means of the optical glass already mentioned; 10. Diamagnetism and the Magnetic Condition of *all* Matter, 1846; 11. Polarity of Diamagnetics, and the Relation of Diamagnetism to Crystalline Forces, 1849; 12. Relation of Gravity to Electricity, 1851. This, as before remarked, is F.'s attempt to prove a conservation of *statical* force. The results are all negative, but are none the less worthy of careful study; the mode of experimenting detailed in the paper, and the precautions taken and required, render it a model for every physicist. 13. Atmospheric Magnetism, 1851. An attempt to explain the diurnal changes of the earth's magnetic force by the solar effect on the oxygen of the air; a very interesting paper.

We have omitted many things well worthy of notice even in so slight a sketch as this, but F.'s name will be found in these pages in connection with something new in nearly every branch of physics.

FARCE, a dramatic piece of a low comic character. The difference between it and comedy proper is one of degree, and not of kind. The aim of both is to excite mirth; but while the former does so by a comparatively faithful adherence to nature and truth, the latter assumes to itself a much greater licence, and does not scruple to make use of any extravagance or improbability that may serve its purpose. It does not, therefore, exhibit, in general, a refined wit or humour, but contents itself with grotesque rencontres, and dialogues provocative of fun and jollity. The name is differently explained. In any case, it comes originally from the Latin *farcire*, to stuff; but while Adelung says that, in the middle ages, *farce* signified in Germany certain songs, which were sung between the prayers during divine service, others derive it from the Italian *farsa*, this from the Latin *farsum* (stuffed); while Paolo Bernardi states that it comes from a Provençal word *farsum*, meaning a *ragout*, or mess of different ingredients, an opinion which has this to say for itself, that the *dramatis personæ*, *Jack-pudding*, &c., were generally named after special dishes or mixtures. The first farces are said to have been composed by the society of the *Clercs de Bazoche* in Paris, about the year 1400, as a contrast to the ecclesiastical plays performed by the religious orders. The most widely celebrated and the oldest is the *Farce de Maître Pierre Pathelin*, which some consider to be a composition of the 13th c., but which was more probably executed by one Peter Blanchet, about 1480. Subsequently, Molière elevated and refined the farce into pure comedy, in his *Médecin Malgré lui*, *Malade Imaginaire*, *Les Fourberies de Scapin*, and other inimitable productions. In England, the origin of the modern farce dates from about the commencement of the 18th century. It then began to be regarded as something distinct from comedy proper, and to constitute a special theatrical entertainment. Of all the numerous farces which have been performed before English audiences, only those of Samuel Foote have kept a place in literature.

FARCY in horses depends upon the same causes as Glanders (q. v.), which it usually precedes and accompanies. The absorbent glands and vessels, usually of one or both hind limbs, are inflamed, tender, swollen, hard, and knotted. The vitiated lymph thus poured out softens, and ulcers, or farcy buds appear. Unlike the ulcers of glanders, they are curable, but require time and care. They must be scarified with the hot iron, which, to prevent their spreading, may also be gently run over the adjacent sound skin. Good feeding and comfortable lodgings are essential, and if they do not interfere with the appetite, give tonics, such as a drachm each of sulphate of copper and iodine, repeated twice a day.

FA′RDEL-BOUND, a disease of cattle and sheep, consists of impaction of the fardel bag, or third stomach, with food, which is taken in between the leaves of this globular stomach, there to be fully softened and reduced. When the food is unusually tough, dry, or indigestible, consisting, for example, of overripe clover, vetches, or ryegrass, the stomach cannot moisten and reduce it with sufficient rapidity; fresh quantities continue to be taken up, until the overgorged organ becomes paralysed, its secretions dried up, and its leaves affected with chronic inflammation. The slighter cases so common amongst stall-fed cattle are 'loss of cud,' indigestion, and torpidity of the bowels. In severer form, there is also fever, grunting, swelling up of the first stomach, and sometimes stupor or epilepsy. The overgorged stomach can, moreover, be felt by pressing the closed fist upwards and backwards underneath the false ribs on the right side. The symptoms often extend over ten days or a fortnight. Purgatives and stimulants are to be given. For a full-grown beast, give, in three or four bottles of water or thin gruel, ½ lb. each of common and Epsom salt, 15 ground croton beans, a drachm of calomel, and two ounces of ginger. If no effect is produced, repeat this in 12 or 15 hours. Inject soap and water clysters every hour, withhold all solid food, and allow only sloppy mashes, treacle and water, or thin linseed tea. An occasional bottle of ale, with an ounce or two of ginger, often expedites the action of the physic, and wards off nausea and stupor.

FAREHAM, a town and sea-bathing place in the south of Hampshire, on a creek at the north-west end of Portsmouth harbour, 12 miles east-south-east of Southampton, and 9 miles north-north-west of Portsmouth. It has manufactures of earthenware. Pop. (1861) 6169.

FAREL, Guillaume, one of the most active promoters of the Reformation in Switzerland, was born in the year 1489 in Dauphiné. He studied at Paris, and was at first distinguished by his extravagant zeal for the practices of the Catholic Church. 'Truly,' says he in one of his letters, 'the papacy itself was not so papistical as my heart.' Intercourse with the Waldenses, and with his friend Lefevre d'Etaples, induced him to study the Scriptures; the result was his conversion to Protestantism, and F., who was by nature vehement even to indiscretion, immediately commenced to proselytise. The chief scene of his labours was France and Switzerland. At Basel, 15th February 1524, he opened his career of controversy and evangelisation by publicly sustaining 30 theses on the points in dispute between Roman Catholicism and Protestantism. In less than two months, he was compelled to leave, mainly on account of a quarrel between himself and Erasmus, whom, on account of his moderate or trimming policy, F. had compared to Balaam. F. next went to Strasbourg, and afterwards to Montbeliard, where his iconoclastic way of preaching the gospel excited the alarm of his friends, several of whom, Œcolampadius among others, censured him sharply for his violence. His zeal was next manifested in the canton of Bern. It was also chiefly through his exertions that the towns of Aigle, Bex, Olon, Morat, and Neuchâtel followed the example of Bern in embracing the Reformation. In 1532, he went to Geneva, where his success was at first so great, that on account of the agitation excited, he had to leave the city. He returned in 1533, was again compelled to withdraw, but once more entered it in 1534. This was his year of triumph; the Reformers filled the churches, and the Catholic clergy, who had made themselves odious to the citizens by abetting the despotic schemes of the Duke of Savoy, retired to Lausanne and Fribourg. In August 1535, the town council of Geneva formally proclaimed the Reformation. F., however, was a missionary, not a legislator, and the organisation of the Genevan Church passed into the hands of Calvin (q. v.). The severity of the new ecclesiastical discipline produced a reaction, and in April 1538, the two reformers were expelled from the city. F. took up his residence at Neuchâtel, where the reformed church was in a state of deplorable disorder. He composed its differences, and drew up a constitution, which it accepted, after long and stormy debates, in 1542. In September of the same year, we find him fighting the battle of the Reformation at Metz. After his return to Neuchâtel, he frequently visited Calvin, whose authority in Geneva had been completely restored. It was on one of these occasions that he was present at the burning of Servetus, and though not, comparatively speaking, a bigoted Calvinist, he allowed his orthodoxy on that occasion to choke his humanity, exclaiming, as the unhappy heretic uttered his last prayer to God from the flames: 'See what power the devil has over one who has fallen into his hands.' In 1557, along with Beza, he was sent to the Protestant princes of Germany, to implore their aid for the Waldenses, and on his return—inexhaustible in his activity—he sought a new sphere of evangelistic labour in the regions of the Jura Mountains. When trembling upon threescore-and-ten, he married a young wife, very much to Calvin's disgust, who sarcastically speaks of him under the circumstances as 'our poor brother.' But neither his newly formed domestic ties, nor the infirmities of age, could quench his missionary zeal. In 1560—1561, he proceeded to his native Dauphiné, and passed several months at Gap, preaching against Catholicism with all the ardour of his youth. In November 1561, he was thrown into prison, but was shortly after rescued by his friends. In 1564, he paid a visit to the dying Calvin; his strength, however, was now nearly exhausted, and on the 13th September 1565 he expired at Neuchâtel, leaving a son named Jean, who survived him only three years. F. was a man of extensive scholarship, and wrote largely, but his works very inadequately represent the genius of the man. Compare Kirchhofer's *Das Leben Wilhelm Farels* (2 vols., Zurich, 1831—1833), and C. Schmidt's *Etudes sur Farel* (Strasbourg, 1834).

FAREWELL, Cape, the southern extremity of Greenland, lies in lat. 59° 49′ N., and long. 43° 54′ W. It is generally beset with ice, which, according to recent authorities, appears to come from the north-east, and to sweep round into Davis' Strait. Hence it is but little known; and, in fact, the Danish traders, in passing to and from the settlements on West Greenland, seem uniformly to maintain an offing of more than 100 miles.

FARI'A Y SOUSA, Manoel, a Portuguese historian and poet, was born of an ancient family at Caravella, in the province of Entre Minho e Douro, 18th March 1590, and studied at the university of Braga. For some time he was in the service of the Bishop of Oporto, but shortly after 1613 he went to Madrid, where, however, he did not long remain, as he found no opportunity there of improving his circumstances. In 1631, he obtained the office of secretary to the Spanish embassy at Rome, where his extensive acquirements procured him the notice of Pope Urban VIII. and of all the learned men of the city. After some time, he returned to Spain, and died at Madrid 3d June 1649. F.'s writings are partly in Spanish, and partly in Portuguese. Of the former, we may mention, *Discursos morales y politicos* (2 vols., Madr. 1623—1626), *Epitome de las Historias Portuguesas* (Madr. 1628), *Comentarios sobre la Lusiada* (2 vols., Madr. 1639), *Asia Portuguesa* (3 vols., Lisbon, 1666—1675), *Europa Portuguesa* (3 vols., Lisbon, 1678—1680), *Africa Portuguesa* (Lisbon, 1681), and the greater portion of his poems, which he collected under the title of *Fuente de Aganippe o Rimas Varias* (Madr. 1644—1646). These poems consist of sonnets, eclogues, canzones, and madrigals. F., however, composed about 200 sonnets and 12 eclogues in the Portuguese language; and it is mainly by these, and also by three theoretical treatises on Poetry, that he has influenced the development of the poetic literature of Portugal, in which he was long regarded as an oracle. His poetry exhibits talent and spirit, but is on the whole tasteless and bombastic. F. is not to be confounded with another Portuguese author of the same name, who was born at Lisbon in 1581, and died at Evora in 1655, and who was one of the most learned numismatists of his age.

FARI'NA is the term used by many writers on bees, instead of *pollen*, to denote the pollen of flowers collected by bees for feeding their larvæ. See Bee.

FARI'NA, a Latin term for meal or flour, which has been adopted into the English and other languages, and is very frequently employed both in scientific and popular works. The term farina is also frequently extended to many substances, which agree with the meal of the corn-plants or Cerealia (q. v.), in containing much starch, and food made of such substances is often called *farinaceous*, its qualities more or less resembling those of the food derived from the cerealia. Of the different kinds of farina, those produced by mere trituration of the seeds of grasses (corn), hold the first place for importance and usefulness. Most similar to them are those obtained in the same manner from certain other seeds. See Cerealia. The farina of the different kinds of Pulse (q. v.), or seeds of leguminous plants, has considerably different properties. For the qualities, chemistry, commercial importance, &c., of the different kinds of meal, see Meal.—Other farinaceous substances, consisting chiefly of starch, are obtained from roots—often from tubers—of plants of very different natural orders; some kinds also, as sago, from stems. Cassava meal, which contains, along with starch, much vegetable fibre and protein or albuminous substances, is commonly called farina (*Farinha*) in many parts of South America, where it is a principal article of food.

Fossil farina, *mountain milk*, or *Agaric mineral*, is a deposit of silicified animalcules, obtained from China, &c. In 100 parts, it consists of silica $50\frac{1}{2}$, alumina $26\frac{1}{2}$, magnesia 9, water and organic matter 13, with traces of lime and oxide of iron.

FARI'NI, Carlo Luigi, an Italian author and statesman, was born in 1822 at Russi, in Ravenna, in the north of Italy. Having, with great success, studied medicine at Bologna, F. first became known by several publications belonging to the science of medicine, and soon afterwards by contributions to various scientific periodicals. In 1841 and 1842, having mixed himself up with politics, he was obliged to leave the Roman States, and change his residence repeatedly until he finally settled at Turin. The amnesty following shortly upon the accession of Pio Nono, opened to F. not only his native country, but also a new career, through the liberal system inaugurated by the supreme pontiff. In 1847, he was called into the reformed ministry, as a substitute to the home secretary; in 1848, he was present in the suite of Carlo Alberto at Volta, and after the flight of the king, protested against the proclaiming of a republic. During the short ministry of the unfortunate Rossi (q. v.), F. was director-general of the sanitary and prison department at Rome, from which post, however, he retired as soon as the reaction under Antonelli began to be established. Upon the occupation of Rome by the French, F. became once more an exile, but for a short time only, for in Piedmont he found a home as well as public honours. In 1850, he held the seat of Minister of Public Instruction in the cabinet of Victor Emmanuel II., and on retiring from office, was named a member of the supreme council; and has ever since sat as a member of parliament. When, after the overthrow of the Bourbon princes, as also of the papal government in the Legations (1859), Central Italy resolved to annex itself to the kingdom of Victor Emmanuel, by means of universal suffrage, it was F. who directed the popular mind with such admirable success that, on the day of ballot, not one vote was delivered asking for a separate kingdom. As governor of Central Italy, he shewed an undaunted courage against the threats of Austria, and exhibited a thoroughly consistent moderation against the unruly promptings of the Mazzinians. The same qualities accompanied his measures when the newly acquired kingdom of Naples was to be reorganised. It has been said that 'Farini was the mind of Italy, as Garibaldi was its sword.' Among his literary productions may be mentioned, *Il Stato Romano* (The Roman State), translated into English under the superintendence of the Right Honourable W. E. Gladstone (London, 4 vols., 1859); *Storia d'Italia* (History of Italy), a continuation of Botta's celebrated work. F. was also a constant contributor to Count Cavour's *Risorgimento.*

FARIS ECCHIDIAK, an Arab poet and litterateur, was born about the year 1796. In religion, he is a Syrian Christian. He studied at Cairo under the ulamas of the mosque of El-Azhar, and in 1836 procured for M. Fresnel some very valuable commentaries upon the poem of *Shanfara.* He was afterwards invited to Malta by an English missionary society, who wanted his services in their Oriental printing establishment. The dedication of a poem to the Bey of Tunis about 1847, induced that monarch to send a war-vessel to Malta, for the purpose of bringing F. to Tunis, where the poet obtained a distinguished reception, and many rich presents. Subsequently, he went to England, where he was employed in revising the text of a translation of the Bible into Arabic, by the Society for the Propagation of the Scriptures. In 1851, he published in London the New Testament in Arabic. He subsequently resided in France for a considerable time, and published there, along with M. G. Dugat, in 1854, a French grammar in his native tongue for the use of the Kabyles of Algeria. His principal work is entitled *La Vie et les Aventures de Fariak* (Paris, 1855); it contains a narrative of his own travels, with critical observations on the Arabs and other peoples whom he visited. Some of his own poems are also interspersed. F. returned to London the year before the publication of this work. On the outbreak of the Crimean War, the sultan appointed him one of his dragomans or interpreters, but he has never discharged the duties of his office. F. is said to possess in manuscript a collection of poems, called *The Divan*, which are highly spoken of by those who have seen them.

FARM (of uncertain derivation), the term usually employed in Britain to signify a piece of land, either in pasture or in cultivation, held in lease by a tenant from the proprietor. In the United States, the term farmer is often applied to a person who owns as well as cultivates land. The tenure on which land is held by farmers differs in different countries. In some parts of continental Europe, the farmer hires the land on the principle of a kind of partnership with the proprietor. See METAYER. In England, land is usually let for a certain annual rent, and either by a yearly term, or at the good-will of the landlord. In Scotland, the process of land-letting is on a footing remarkably advantageous for tenant and proprietor, as well as serving the best interests of agriculture, and on this account it is gradually being introduced into England. Under the head LEASE will be presented the details of Scottish tenantcy; a few leading features need here only be adverted to. The Scottish farmer is presumedly a capitalist able to work the land in the best manner. He is given a lease of 19 years, during which period he has entire possession of the land, and from the length of tenure is encouraged to sink money that will be amply repaid to him by increased crops. He cannot sublet, but his lease is heritable by one of his family. The landlord at the outset erects farm-buildings, constructs fences and roads, and otherwise puts the farm into a proper condition —the whole of which operations may cost him from £2000 to £4000. Receiving his farm in this state, the tenant is bound to keep it so, and to deliver it up in a properly tenantable condition at the conclusion of his lease. By these explicit arrangements, the outgoing tenant can make no claim for improvements either from the landlord or from his successor the incoming tenant, who is merely called on to pay for such crops as happen to be on the ground; and this is settled by arbiters mutually chosen. See FALLOW. Contests about tenant-right, such as occur in Ireland, from the practice of assigning to farmers the duty of erecting buildings and making permanent improvements, are thus totally unknown in the Scottish system. The method of paying rent for farms in Scotland is not uniform. In some districts the annual rent is a fixed sum, but in other places it is a common practice to pay partly a fixed sum, and to leave another portion to be paid in grain, or rather the money value of so much grain according to the average market prices each year, as determined by a jury in every county. See FIARS. This last plan is the fairest for all parties, but some farmers prefer to pay a fixed sum-total, and so speculate on a rise in markets. In whatever manner the rent is adjusted, it is stipulated to be paid, as nearly as possible, in two equal portions, at Whitsunday (May 15) and Martinmas (November 11), but in practice the landlord gives three months' credit on each occasion—the Whitsunday rent being exigible at Lammas (August 4), and the Martinmas rent at Candlemas (February 2). At all times, however, the landlord has a right of Hypothec (q.v.) over the crops, and can take measures to avoid being defrauded of his proper claims. Usually, the very best feeling subsists between landlord and tenant, and extreme measures are of rare occurrence.

Pursuing this abstract of the Scottish system, the landlord usually binds his tenant to farm or cultivate the land according to the most approved systems in use in the district. Such a course is no doubt necessary, to prevent the abuses that might arise from negligence or ignorance; but the restrictions have often been carried too far, and have formed barriers in the way of improvements. It is not, perhaps, very easy to define what is liberal and what stringent, as practices vary according to circumstances of soil or locality. So far as regards mere cropping, it would not be much amiss, however, on most arable farms, to forbid more than one-half of the land being in white crops during the last four years of the lease. Green crops, it may be stated, do not prevent exhaustion so much as they prevent the land being overrun with weeds. It is perhaps not superfluous to observe here that leases should be written in clear and concise language, and as far removed from ambiguity as possible.

The size of farms is regulated by many circumstances. On land adapted for green cropping, and remote from towns, large farms form good subjects for capitalists, and consequently prevail. Stiff clay soils are rather against extensive culture. Where crops are grown that require much hand-labour, farms become small in size. Flax, rape, vines, and market-garden produce all tend to lessen the size of farms. In new countries, too, where there is no slave labour, farms are mostly small; for labour being high, it is too precious to be profitably employed on a large scale where the prices of produce are small. Grazing farms, whether in the Highlands or Australia, form good outlets for large capitalists.

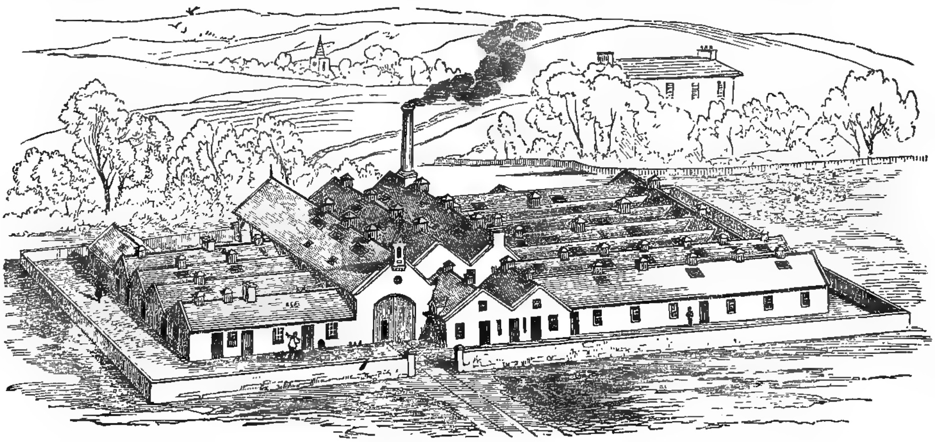
Under the modern system of farming in Britain, not less than £10 of capital per acre is required to farm green-crop land. Where cattle are pastured on arable lands instead of sheep, it requires still more capital. Highland grazings require from 1 to 3 acres to maintain a sheep throughout the season. The rent varies from 2*s.* to 10*s.* a head for each sheep kept; the value of each sheep being from £1 to £2 a head, according to the kind and age of the stock.

The profits of farming fluctuate quite as much as those of any other trade. Strict personal superintendence is one of the first requisites of success. Without this, the details will be neglected, and loss will ensue. 10 per cent. on the capital invested is a good return. Formerly, it was thought that arable land should yield a gross produce equal to three times the rental. One part went for rent, one for expenses, and the other for profit. But no such absolute rule can be laid down; for while, as in other trades, some are making large profits, others are losing money. Skill and attention are the qualities which command success in farming as in other things.

A farmer necessarily possesses large numbers of animals—horses, cattle, sheep, pigs, and poultry. These have all to be reared and tended, and demand no little care and experience. Proper seeds must be selected; and the proper cultivation of the land for the different crops necessitates a succession of processes which require to be attended to. These, however, will be taken up under their respective heads.

FARM BUILDINGS. Each farm must possess a residence for the farmer, cottages for the servants, and buildings for the stock and crop. The *farm-house* should be commodious and plain, with an extent of accommodation about equal to that which those have who are engaged in commercial pursuits in town employing the same amount of capital. The cottages for the servants should also be plain and roomy, and internal convenience should be more studied than outward ornament.

Proper offices are essential to the economical disposing of the produce of the farm. The corn crops are usually thrashed there, and a large portion of the green crops is consumed by stock, which must be well provided with shelter from the cold. When few turnips were raised, and few cattle fed, large open courts were best suited for converting the straw into manure. Now, however, in many cases, the excrements of the stock are sufficient for wetting all the straw, and hence has arisen the practice of feeding in covered courts and in boxes. In this case, the solid and liquid excrements are carted out along with the straw, which acts the part of a sponge. This is no doubt an excellent way of manufacturing home-made manure; it takes a considerable quantity of straw, however; and as more green crops are raised and consumed on the farm, sufficient straw cannot be got to absorb all the liquid; hence, a saving of the straw is effected by stall-feeding, when the excess of liquid must be collected into tanks, and otherwise disposed of. When it is remembered that ammonia cannot be purchased in the market at the present time under £60 per ton, the utility of husbanding this material when it is freed as the excrements of the stock decompose, must be self-evident. If the solid excrements are kept in a compressed state, no fermentation takes place; and if the manure is of good quality, it should be applied to the fields at once. Liquid manures should be carted out, or distributed by pipes, when the plants are in a growing state, otherwise part will be washed out of the soil. Covered farmyards are rapidly extending over the country. It is the cheapest and best way of erecting farm-offices. Our cut represents a bird's-eye view of a 'farm-steading,' for a farm of 500 acres, and a model of which was commended by the judges of the Berwick cattle-show in 1854.



Isometrical View of Covered Homestead.

The steading is on the covered principle, all the various departments being under one roof. It will be seen by the ground-plan that the food-preparing houses are ranged as convenient as possible to those in which the food is to be consumed, and that the relative positions of every other department have been carefully studied. This is the great point to be attended to in the formation of all homesteads, whether open or covered.

Ventilation.—Without good ventilation, a covered homestead must be a nuisance. All the apartments are so arranged that, unless fresh air circulate through them, and they are kept perfectly clean, there must constantly be unwholesome effluvia in the interior—the foulness of one apartment being communicated to another. The system of ventilating this farmstead is certain to give most satisfactory results, if only ordinary care be taken to keep the different houses as clean as they ought to be. The arrangements are briefly as follows:

Under each feeding-passage is built a circular air-shaft, 30 inches in diameter; in connection with these there are feeding-mouths with gratings on the outside of the building; inside, there are numerous finely perforated gratings; by sliding-valves, wrought by a cord and pulley, the supply of air is regulated. Besides these, there are gratings every 10 or 12 feet along the exterior walls, perforated so as to admit near the floor a considerable quantity of air. The roof, too, is provided with ventilators with vertical spars, and openings are left here and there in the sarking, to act as induction and eduction tubes. The numerous perforated apertures throughout the building will admit twice the quantity of air required for the respiration of the animals, and are so under command that they will neither admit flies in summer, nor too large a supply of cold air in winter. A covered steading, somewhat similar in construction to the above, has been erected at Glen, in Peeblesshire, where the ventilation of the enclosed cattle-courts, &c., is admirable.

We would only remark, that to carry out this principle of ventilation is somewhat expensive. A cheap and yet efficient system of ventilation for cattle is to cover the yards with pan-tiles without plaster or lath. Those who wish to see farm-offices economically erected, at the same time combined with the most perfect ventilation, we would recommend to visit some that have been lately built on the property of Lord Kinnaird, Rossie Priory, Perthshire. As a general rule, farm-steadings are erected at too great an expense. For further information, see *The Book of Farm Buildings*, by Henry Stephens, F.R.S.E., and R. Scott Burn (Edin. Blackwood and Sons, 1861).

FARM-SERVANTS. The introduction of large farms caused a wide difference to arise between the condition of master and servant. The latter has no doubt had his condition meliorated, though much remains yet to be done. Large farms effect economy in the amount of labour, and where these superseded the small holdings or pendicles, a certain number of the population had to betake themselves to the towns or the colonies. This latter process had the effect of diminishing the population in the country districts. The general advance, however, which has taken place in the wages of the labouring-classes has been happily shared in by farm-servants. They have now the means of increasing their physical comforts, and in general, wherever better cottages have been built, farm-servants have proved more trustworthy. Wages vary much, according to the locality. In the strictly agricultural county of Dorsetshire, they range from 8*s.* to 10*s.* a week. In the manufacturing districts, such as in Yorkshire, on the other hand, they run up to 15*s.* to 16*s.* a week. In Scotland, ploughmen are generally paid partly in produce, but taking everything into account, wages will amount to nearly 15*s.* a week all the year through for good hands; each family being provided with a house at a short distance from the farm-offices. See BOTHY. Female farm-servants receive from £8 to £10 a year, with food.

FARMER, RICHARD, D.D., a well-known scholar of the last century, was born at Leicester, August 28, 1735, and was entered a pensioner of Emmanuel College, Cambridge, in 1753. In 1760, he took his degree of M.A., and was appointed classical tutor of his own college. It is not known when he took orders, but, while he held the office of tutor, he acted as curate at Swavesey, a village eight miles from Cambridge. In 1766, he published his once famous *Essay on the Learning of Shakspeare* (reprinted in 1789 and in 1821), the purpose of which was to shew the sources whence the great dramatist derived his knowledge of the ancients. F. proved that it was from translations, and that Shakspeare has often cited the phraseology, and even the errors, of the translators. In 1775, he was elected to the mastership of Emmanuel College, and in 1778, chief-librarian of the university. In 1780, he obtained a prebendal stall at Lichfield, but in 1788, resigned it for the office of canon residentiary of St Paul's. He died September 8, 1797.

FARMERS-GENERAL (Fr. *fermiers-généraux*) was the name given before the Revolution of 1789 to the members of a privileged association in France, who farmed or leased the public revenues of the nation. This peculiar system of tax-gathering dates from an ancient period. For each class of imposts there was a special administrative board, presided over by one of the farmers-general, or by one of his assistants. At first, the leasing of the public revenues was based on the competitive system, and determined by the estimates handed in; but latterly, every formality, every preliminary guarantee of this nature disappeared, and the leasing wholly depended on the favour or jobbery of the government officials. The minister of finance selected the farmers-general at his pleasure, but his choice was always regulated by the present, or rather bribe (*pot-de-vin*) offered to him; and which, we may presume, was never inconsiderable, inasmuch as its value was fixed by the minister himself. Generally, shares in the concern were assigned by the king to his favourites, male and female. The number of farmers-general was ordinarily 40, but shortly before the Revolution it had risen to 60. The lease was signed by a salaried deputy, who was responsible to the king alone. The king occupied the position of a creditor towards the farmers-general, and could coerce them into payment of the stipulated sum as a just debt; the farmers-general, on the other hand, occupied a similar position towards their subordinates. The entire sum which it was necessary to place in the national treasury—or, in other words, the annual national revenues—amounted to 180 millions of livres. The rest was enormous profit, for we are certainly within the mark in estimating it at seven million of livres. The powers, rights, and duties of the farmers-general were defined by special decrees; but however severe may have been the fiscal laws against fraud and contraband, it is notorious that, shortly before the Revolution, abuses of the most flagrant description had demoralised the system and the men. The consequence was inevitable. During the Revolution, most of these odious tax-gatherers perished on the scaffold, the innocent among them being occasionally confounded with the guilty—the real capitalist with the selfish and greedy adventurer. Even the virtues and the learning of the illustrious Lavoisier could not save him.

Farmers of the revenue are an institution of ancient origin. The Roman *publicani* (q. v.) were officers of this kind; and duties of various kinds were at one time farmed in Great Britain. See EXCISE.

FARMING'S ISLAND, an island reported to be in the North Pacific Ocean, north of the Sandwich Islands, in lat. 30° 49′ N., and long. 159° 20′ W., was formally taken possession of, for the Queen of England, on the 8th February 1861, by her Majesty's steamer *Albert.* The harbour was called English Harbour, and a point, on which there is a settlement, was termed English Point.

FARNE, FEARNE, or **FERN ISLES**, or the STAPLES, form a group of 17 islets and rocks, some being visible only at low tide, two to five miles off the north-east coast of Northumberland, opposite Bamborough. On one of the isles is the tower of a priory, built to the memory of St Cuthbert, who spent the last two years of his life here. There is a hole called the churn, through which the sea rises. The passage between the isles is very dangerous in rough weather. Two of the islets have each a light-house. Here the *Forfarshire* was wrecked in 1838 (see DARLING, GRACE); and here, in 1843, the *Pegasus* met the same fate, and 60 persons were drowned.

FARNE'SÉ, the name of an illustrious family in Italy, whose origin can be traced to the middle of the 13th c., when it possessed the castle of Farneto, near Orvieto. Many of its members have filled the highest offices in the church. In 1534, Cardinal ALESSANDRO FARNESE was raised to the papal see under the title of Pope Paul III. (q. v.), and as his great aim was the aggrandisement of his family, he erected Parma and Piacenza into a duchy, which he bestowed on his natural son, PIETRO LUIGI. Pietro was one of the most dissolute men of his period, and after many tyrannical attempts to limit the privileges of the nobles, he was assassinated 10th September 1547. He was succeeded by his son OTTAVIO (born 1520, died 1585), who married a natural daughter of Charles V., and whose reign was marked by an unbroken peace, and by various efforts made for the good of his subjects.

ALESSANDRO FARNESE, son of Ottavio, was born in 1546. He served his first campaign under his uncle, Don John of Austria, and distinguished himself at the battle of Lepanto, in the year 1571. He afterwards followed his mother into the Low Countries, then in a state of insurrection, and aided in obtaining the victory at Gembloux, 31st January 1578. He was made governor of the Spanish Netherlands by Philip II., and carried on the war against the Prince of Orange. The ill success of the expedition against England, to the command of which he had been appointed by Philip II., grieved him the more from the contrast it presented to his former successes. On his return to the Netherlands, he was appointed commander-in-chief of the army despatched to the assistance of the Catholics in France, and compelled Henry IV. to raise the siege of Paris. Being, however, ill supplied with provisions and money by Philip, and insufficiently supported by the League, he was forced to yield to the superior power of Henry IV., and died soon after at Arras, in 1592. F. was really an able warrior, and though severe in his discipline, was almost worshipped by his soldiery. RANUCCIO, his son and successor, did not possess the brilliant qualities of his father: he was sombre, austere, greedy, and proud. A conspiracy was hatched against him, and Ranuccio was seized, and thrown into prison. He died in 1622.—ODOARDO, a natural son of the preceding, was a prince remarkable for the elegance of his manners, and also, according to Muratori, for his magnificence, magnanimity, and liberality. He died in 1646, at the age of 34.—The family became extinct in the person of ANTONIO F., who died in 1731.

The name of the Farnese family has been bestowed upon several celebrated works of art. These are—1. The *Farnese Palace* at Rome, an edifice raised by Pope Paul III., before his accession to the holy see, after the design of Antonio da San Gallo. It is in the form of a quadrangle, and was completed by Michael Angelo. The palace is one of the finest in Rome. The antique sculptures for which it was formerly renowned are now in the Museum at Naples; a few classic works, however, are still to be seen in the great hall. The gallery contains the frescoes of Annibal Caracci, which are very valuable, as exhibiting in the most complete manner the new line of art which he struck out. In a room adjoining the gallery, are some mythological fresco-paintings by Domenichino. 2. The *Farnesina* is a very elegant palace in Trastevere. It owes its celebrity chiefly to the frescoes of Raphael; but it also contains frescoes by Peruzzi, Sebastian del Piombo, and a colossal head in *chiaroscuro*, attributed to Michael Angelo. Among the antiques, formerly belonging to the Farnese family, now in the museum at Naples, are two which still bear the name of their original owners. 3. The *Farnese Bull* is the name given to a colossal group attributed to Apollonius and Tauriscus of Tralles, in Asia Minor, who probably belonged to the Rhodian school, and lived about 300 B. C. The group represents Dirce bound to the horns of a bull by Zethus and Amphion, for ill usage of her mother—a subject which, notwithstanding the vigorous mode of treatment, is on the whole unsatisfactory. Pliny mentions the transference of the group to Rome, where it first adorned the library of Asinius Pollio, and afterwards the Baths of Caracalla. It was discovered anew in the year 1546, restored by Bianchi, and placed in the Farnese Palace. 4. The *Farnese Hercules*, copied by Glykon from an original by Lysippus. It exhibits the hero, exhausted by toil, leaning upon his club; the muscles and veins are still swollen, the head inclined, the expression melancholy; one hand rests upon his back, and grasps one of the apples of the Hesperides.

FA'RNHAM, a town in the west of Surrey, on the left bank of the Wey, 10 miles west-south-west of Guildford. It consists chiefly of one street running east and west. The principal feature is the stately old castle of the bishops of Winchester, first built by Bishop de Blois, brother of King Stephen. The castle was razed by Henry III., rebuilt and garrisoned by Charles I., and restored in 1684 to its present state by Bishop Morley. It is an embattled quadrangle of brick, covered with stucco. F. has belonged to the bishops of Winchester since 860, when Ethelbald of Wessex bestowed it on them. Some parts of the parish church were built in the 12th, 15th, and 16th centuries. The chief trade is in hops, a very fine variety of which is grown in the vicinity. Pop. (1861) of town about 4500, of parish 9351. William Cobbett was born and is buried here. The vicinity of Aldershott camp, which is only about 6 miles to the north of F., has increased the activity of the town during the last few years.

FA'RO, a pleasant and wealthy episcopal city of Portugal, capital of the province of Algarve, is situated in a plain at the mouth of the Fermoso, in lat. 37° N., and long. 7° 52′ W. It has, on the whole, a modern aspect, but its houses are not handsome, and its streets are in general narrow. It is surrounded with walls, which are said to have been built by the Moors. The harbour of F. is somewhat confined, but the road formed by three islands at the mouth of the river affords good anchorage. F. has considerable exports of oranges, figs, anchovies, and cork. It has also a prosperous fishery. Pop. 7900. The number of blind people here met with is surprising, groups of five and six together being frequently observed. This is accounted for by the light sandy soil which prevails.

FARO, or **PHARO**, a game at cards of the nature of hazard, played chiefly at gambling establishments. See Hoyle's *Games.*

FARÖE ISLES (Dan. *Faar-Oen*, sheep-islands), a group of islands, 22 in number, of which 17 only are inhabited, belonging to Denmark, and lying nearly midway between the Shetlands and Iceland, between 61° 25′—62° 25′ N. lat., and 6°—8° W. long. The principal island, Stromoe (capital, Thorshavn), is 27 miles long, and 8 miles broad; those next in importance are Osteroe, Vaagoe, Bordoe, and Sudaroe. Their entire area is nearly 500 square miles; population about 8500. The F. I. consist of basaltic elevations, none of which attain a height of 3000 feet, and trap formations, covered with a thin vegetable soil, which yields pasturage to the cattle and numerous sheep which are reared in the islands. There are no considerable valleys or streams, but small fresh-water lakes are numerous. The coasts, which are steep and lofty, are broken by deep inlets, whirlpools, and rapids, which render navigation perilous. The furious hurricanes which prevail, prevent the growth of trees, or even of most of the ordinary vegetables and cereals; but the climate is so greatly modified by oceanic influences, that, notwithstanding the high latitude, snow rarely lies long on the ground, and the cattle can pass the greater part of the year in the open air. Peat and coal are used for fuel; traces of iron and copper, and opal, chalcedony, &c., are found. The chief sources of wealth are flocks of sheep, and the multitudes of sea-fowl which frequent the rocks. The islanders shew considerable skill in climbing the dangerous cliffs in search of birds, and they are also expert in fishing for seals and whales. Their manufactures are of the homeliest kind, but in return for the numerous articles supplied to them by the mother-country, they yield tallow, train-oil, feathers, skins, and butter, to the Danish markets. The people are of Norwegian origin, a vigorous, laborious, loyal, and religious race, and belong to the Lutheran Church. They are governed by a Danish *amtmand*, or bailiff, and a landvogt, or director of the police and municipal departments, and are represented in the Danish legislature by a deputy appointed by the king. The islands, which were discovered in the 9th c. by Norwegians, have belonged to Denmark since the incorporation of Norway with that kingdom by the Union of Calmar, and the language of the people is only a slightly modified form of the Old Norse. England held the islands from 1807 to the treaty of Vienna, in 1814. For further particulars, see *Tracings of Iceland and the Faröe Isles*, by Robert Chambers (W. & R. Chambers: London and Edinburgh).

FA′RQUHAR, George, was born at Londonderry in 1678, and received his education at the Dublin University, where, although he did not take any degree, he secured among his comrades the reputation of a wit who was a spendthrift of his witticisms. When he left the university, he was engaged as an actor by one of the Dublin theatres, but, like most dramatists who have figured on the stage, he proved but an indifferent performer. Playing a part in Dryden's *Indian Emperor*, and forgetting that he wore a sword instead of a foil, he accidentally wounded a brother-performer, and was so shocked by the occurrence that he at once quitted the boards. Accompanied by the actor Wilks, he proceeded to London, and shortly after received a commission in the regiment commanded by the Earl of Orrery, which was then stationed in Ireland. Urged by Wilks, and perhaps stimulated by the gaiety and leisure of a military life, he, in 1698, produced his first comedy, entitled *Love and a Bottle*, which proved a success. Two years afterwards, his *Constant Couple* appeared, which met with a brilliant reception, and to which he wrote a sequel, called *Sir Harry Wildair.* In 1703, he produced *The Inconstant*, founded on the *Wild-goose Chase* of Beaumont and Fletcher, a version in which all the coarseness, and none of the poetry, of the elder dramatists is retained. He married in the same year, and falling into serious pecuniary difficulties, he sold his commission, and, struggling with adverse fortune, succumbed. He died of decline in 1707, leaving 'two helpless girls' to the care of his friend Wilks. During his last illness, he wrote the best of his plays, *The Beaux Stratagem*—in six weeks, it is said—and died while its wit and invention were making the town roar with delight.

F. is one of the finest of our comic dramatists. although Pope called him a 'farce writer.' He is less icily brilliant than Congreve, and possesses on the whole more variety and character than any of his compeers. He had wit in abundance, but he had humanity too. He was a tender-hearted and somewhat melancholy man, and—what was rare in his school and in his time—*tears* are found glittering among the brilliants of his fancy.

FARR, William, M.D., F.R.S., an eminent statistician, was born at Kenley, in Shropshire, November 30, 1807, became an assistant-surgeon at the Salop Infirmary in 1826, and after attending privately the medical and scientific classes of the day, went to Paris University in 1829, where he attended the lectures of the most eminent medical professors.' In 1831, he returned to England, and became a member of the university of London, where he completed his professional curriculum. F. has devoted himself mainly to a consideration of the important questions resulting from medical statistics. At first, he found it very difficult to draw the attention either of the public or of medical societies to the subject; but in the year 1837, his article, 'Vital Statistics,' in M'Culloch's *Statistics of the British Empire*, obtained the notice and approval of certain influential persons. In the same year, the registration of all the deaths, and of the causes of death, was commenced in England, and in 1838, F. received an appointment in the General Registrar's Office. Since then, he has been made superintendent of a statistical department, the members of which have drawn up the new *London Tables of Mortality*, the *Quarterly Returns of Births, Deaths, and Marriages*, and the *Annual Abstracts.* In 1851, he was one of the gentlemen employed in taking the census of Great Britain, in connection with which he drew up several extremely interesting reports. F. is the author of a new *Statistical Nosology*, and of various valuable papers on the Finance of Life Assurance, the Income Tax, the Public Health, the Cholera, &c.

FA′RRIER (from *ferrum*, iron), a person who shoes horses and treats their diseases. The better class of farriers often were, and indeed still are, men of great shrewdness and observation, sometimes possessing considerable experience, and with skilful, useful hands. Their management of sick horses is occasionally sensible, but generally altogether empirical. They have usually but crude ideas of the structure, functions, or diseases of animals, and pin their faith mainly on a few carefully cherished recipes. To their calling as horse-doctors and shoeing-smiths (see Shoeing), they usually unite those of cow-leech and cutter of colts and pigs, and although still met with in many of the rural districts of England and Ireland, their practice is gradually passing into the hands of regularly educated Veterinarians (q. v.).

FARRIERS, Army. Farriers-major and farriers are non-commissioned officers in the cavalry, artillery, engineers, and military train, whose duty it is to shoe the horses of their corps, and, generally, to assist the veterinary surgeon in exercising a proper care over the regimental animals. They receive the same pay as other sergeants (with whom they rank); and, in addition, certain allowances proportionate to the number of animals in charge. The sum necessary to defray this allowance for a year is about £10,000.

FARS, or **FARSISTA'N** (anciently *Persis*), a province of Persia, on the east shore of the Persian Gulf, lying between lat. 27° 30′ and 31° 30′ N., and between long. 49° 30′ and 55° E. Area, 55,000 square miles; pop. about 1,700,000, composed of Turkomans, Banjans, Persians, and Jews. The coast region is flat, with a hot climate; inland, the ground rises to an elevation of from 2000 to 3000 feet, the climate is cooler, and valleys, alike remarkable for their beauty and fertility, ranging from 15 to 100 miles in length, are numerous. East of this hilly district the province again becomes flat and sandy; and here occurs the large salt-lake Bakhtegan. The chief rivers are the Bundemeer (anciently Araxes), which flows into Bakhtegan, the Nabon, and the Tab (anciently Arosis), which fall into the Persian Gulf. The province produces tobacco, wine, rice, dates, opium, linen, cotton, silk, cochineal, and roses for the manufacture of attar. It has iron and lead mines, marble and alabaster quarries, and yields also borax and naphtha. It trades mainly with India. The principal towns are —Shiraz, Jehroom, Darab or Darabgerd, Behbehan or Babahan, and Bushire. North of Shiraz, at a distance of about 30 miles, lie the ruins of the ancient and splendid city of Persepolis. F. also contains the remains of Shahpur, a city older than the age of Alexander the Great, and the celebrated sculptured rocks, called by the Persians *Naksh-i-Rustam.*

FARSA'N ARCHIPE'LAGO, a group of islands in the south-east of the Red Sea, the chief of which are Farsan Kebeer, 31 miles long, and Farsan Seggeer, 18 miles, in lat. 16° 30′—17° N., and long. 41° 45′—42° 10′ E. They would be valuable as harbours, were it not for the reefs in the vicinity.

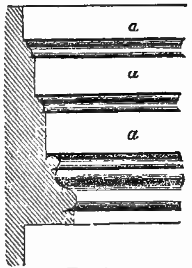
FARTHING (Sax. *feorthung*, from *feorth*, fourth), the fourth part of a Penny (q. v.).

FA'RTHINGALE, old form of the word (as found in Bishop Latimer) *verdingale*, is probably a corruption of the French *vertugade*, which is itself a corruption of *vertu-garde*, signifying guard of modesty. For a description of the farthingale, see Crinoline.

FA'RYNDON INN, the name formerly borne by Serjeants' Inn, Chancery Lane. This building belonged to the bishops of Ely, by whom, in 1411, it was let to the serjeants-at-law. In 1484, the name was changed to Serjeants' Inn (q. v.).

FASA'NO, a town of Italy, in the Terra de Bari, and 33 miles south-east of the town of Bari, is situated on the high road from that town to Brindisi. It is small, but wealthy. The whole of the district of F. abounds in olive plantations, and there are numerous oil-presses in the town and neighbourhood. Pop. 11,450.

FA'SCES were bundles of rods usually made of birch, but sometimes of elm, with an axe projecting from the middle of them, which were carried before the chief magistrates of ancient Rome, as symbols of their power over life and limb. They were borne by the lictors, at first before the kings; in the time of the republic, before consuls and prætors; and afterwards before the emperors. Their number varied, a consul having twelve, and a prætor, six; but within the city only two. Valerius Publicola introduced a law that within the city the axe was withdrawn, except in the case of a dictator, who was preceded by twenty-four lictors, bearing as many fasces. Publicola also made the fasces be lowered at the assemblies of the people, as an acknowledgment of their supreme power.



Fascia.

FA'SCIA, in Architecture, a flat space or band, like a broad ribbon, usually between mouldings, as at *a*, *a*, *a* of the architrave (see fig.). Architraves are called single, double, or triple fasciæ architraves, according to the number of fasciæ into which they are divided.

FASCINA'TION BY SERPENTS. A power has long been popularly ascribed to serpents, or at least to some kinds of them, of fascinating by their eye the small animals on which they prey, so as to prevent the escape of the intended victim, when its escape would otherwise be easy, and to cause it rather to run or flutter into the mouth which is open to devour it. This popular notion has been ridiculed, but is supported by a large amount of evidence, and has been fully adopted by some of the most scientific observers. In the earlier part of last century, Kalm described the rattlesnake as frequently lying at the bottom of a tree, on which a squirrel is seated, and fixing its eyes on the little animal, which from that moment cannot escape, but begins a doleful outcry, comes towards the snake, runs a little bit away, comes nearer, and finally is swallowed. Le Vaillant describes a similar scene, as witnessed by him in Africa, a shrike incapable of moving away from a serpent which was gazing fixedly at it, and dying of fear, although the serpent was killed. Dr Andrew Smith states that the presence of a non-venomous South African tree-snake, *Bucephalus viridis*, in a tree, causes the birds of the neighbourhood to collect around it and fly to and fro, uttering piercing cries, 'until some one, more terror-struck than the rest, actually scans its lips, and almost without resistance, becomes a meal for its enemy.' He adds, 'whatever may be said in ridicule of fascination, it is nevertheless true that birds, and even quadrupeds, are, under certain circumstances, unable to retire from the presence of certain of their enemies; and what is even more extraordinary, unable to resist the propensity to advance from a situation of actual safety, into one of most imminent danger. This I have often seen exemplified in the case of birds and snakes; and I have heard of instances equally curious, in which antelopes and other quadrupeds have been so bewildered by the sudden appearance of crocodiles, and by the grimaces and contortions they practised, as to be unable to fly, or even move from the spot towards which they were approaching to seize them.' Ellis, in his *Three Visits to Madagascar*, records anecdotes of the same kind, and one in particular, of a frog apparently unable to move, until an object was pushed between it and the eye of the snake, when the frog immediately darted away, as if relieved from some mesmeric influence exerted over it.

FASCI'NES (from Lat. *fascis*, a bundle) are fagots for military purposes made of young branches of trees or brushwood, and also of osiers, bound together with yarn or withes. They are about a foot in diameter, and of various lengths, averaging 12 feet, according to the object for which they are intended. Fascines are used in the construction of temporary works; for filling a ditch, and sometimes, in a pile, for setting fire to an obstruction. Before a siege, the soldiers are employed in making fascines in great number; and when needed, each soldier bears one to the place, casts it on the heap, and the quantity required is thus accumulated in a remarkably short time.

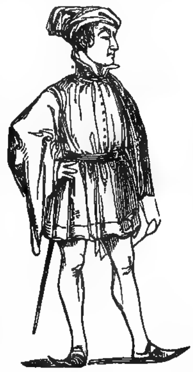
FASCI'OLA, a generic name formerly employed to designate all the *Trematode Entozoa*, as Flukes, &c., which are now, however, divided into many genera.

FA'SHION, or, as the French term it, *La Mode*, admits as little of exact definition as of being referred to any intelligible principle. In every age and country, there has been a recognisable costume or general style of male and female attire, along with certain niceties in the shape, colour, and texture of dress, which, fluctuating according to taste or whim, are known as the fashion—a word which etymologically signifies making in a particular form. The terms fashion and fashionable are, however, so comprehensive as to include much beyond the sphere of the toilet; as, for example, a style of speaking, living, and forming opinions; there being, to use a common phrase, 'a fashion in everything.' It is only in China and some other eastern countries that, in consequence of dress being regulated by sumptuary laws or some equally strict traditions, the fashions of attire remain from generation to generation with little or no change.

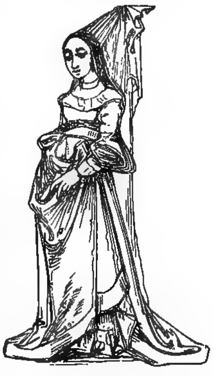
The nature of clothing, and the necessity for its use, being treated in the articles Health and Textile Fabrics, what seems desirable here is to glance at the leading forms of dress and more conspicuous fashions that have prevailed in Western Europe, and more particularly in England, since the dawn of civilisation. Our modern costume has seemingly had a double origin—that of the Romans and of the Teutonic people, who in different branches invaded France and Britain. The usual Roman dress, in the latter period of the Empire, consisted of a tunic, or loose upper garment, with a dress for the lower limbs, called *braccæ;* hence the modern term *breeches*. Over all was occasionally worn by the higher classes the *toga*, or mantle. It is believed that these Roman costumes were generally copied by the greater number of British, at least among the more opulent classes. In the dress of the women, however, there was but little change. They appear in two tunics, the one reaching to the ankles, the other having short sleeves, and reaching about halfway down the thigh: in other words, they resemble a round gown, or bedgown and petticoat, though the latter, distinct from a body and sleeves, is not considered to be ancient. This tunic was called in British *gwn;* hence our word *gown*, of which we still see specimens of short dimensions worn by women of the humbler classes in England, Scotland, and Wales.

The Anglo-Saxon and Danish periods of English history are marked by new peculiarities in costume. Soon after the departure of the Romans, and the arrival of the Saxons in the 5th c., fashions of apparel were introduced from Northern Germany, which continued with no material change for several centuries. The most important improvement in the ordinary dress of the people was the introduction of the *shirt*, a linen garment worn next the skin, for which we are indebted to the Saxon invaders. The common dress of the 8th c. consisted, as we find, of linen shirts; tunics, or a kind of surcoat; cloaks fastened on the breast or shoulders with brooches; short drawers met by hose, over which were worn bands of cloth, linen, or leather, in diagonal crossings. Leathern sandals were worn by the early Anglo-Saxons; but afterwards the shoe became common: it was very simple, and well contrived for comfort, being opened down the instep, and there, by a thong passed through holes on each side of the slit, drawn tight round the feet like a purse. A felt or woollen cap, called *hæt* (hence our modern word *hat*), was worn by the higher class of Anglo-Saxons; but it is generally believed that the serfs or lower orders were without any other covering for the head than what nature had given them. The Anglo-Saxon tunic still exists in the *smock-frock*, a species of overall generally worn by the peasantry and some farmers in England. The *blouse*, worn by workmen in France and Switzerland, has an equally early origin.

The Norman Conquest introduced greater taste and splendour into British costume. Now, were introduced Gloves (q. v.), along with the fashions of chivalry. The annexed engraving represents a gentleman of the reign of Henry V.: he is dressed in a short tunic, buttoned in front, with girdle, large loose sleeves, tight hose forming pantaloons, and stockings in a single piece, peaked shoes, and head-cloth or cap. About this period, silks and velvets of divers colours came into use among the higher classes, by whom gold chains were generally worn. The dress of ladies was of the richest kind. Gowns were embroidered and bordered with furs or velvet; and the bodice, laced in front over a stomacher, now first appeared. But the greatest eccentricity was the lofty steeple head-dress, shewn in the annexed portrait; this consisted of a roll of linen, covered with fine lawn, which hung to the ground, or was mostly tucked under the arm.



Gentleman of Fifteenth Century.



Lady of Fifteenth Century.

In the 16th c., the upper part of the long hose or nether garments began to be worn loose, or slashed with pieces of different colours let in, and the arms and shoulders of the doublet or jacket were fashioned in a similar style. Boots were also worn loose on the leg, with the upper part falling down; hence the origin of the *buskin*. Ruffs or ruffles, collars, and velvet bonnets with feathers, came likewise into use, as may be seen from the paintings of Henry VIII. Hall, the chronicler, describes several of Henry's superb dresses, and among them a *frocke*, or coat of velvet, embroidered all over with gold of damask, the sleeves and breast cut and lined with cloth of gold, and tied together 'with great buttons of diamonds, rubies, and orient pearls.' The cloaks and mantles were of corresponding magnificence. The shirts were pinched or plaited, and embroidered with gold, silver, or silk. The term *hose* continued to be applied to the entire vestment, from the waist to the feet, throughout this century: the material is more distinctly stated, for Henry wore knit silk as well as cloth hose: the precise period of the separation of the hose into breeches and stockings, is not so clear as the derivation of the latter term from the '*stockying* of hose;' 'that is, adding the lower part that covered the legs and feet to that which was fastened by points to the doublet,' and was called the *stocks*. The shoes and buskins were of the German fashion, very broad at the toes, and of velvet and satin, slashed and puffed. The hats, caps, and bonnets were of almost endless forms and colours.

The dress of the middle ranks in the reign of Henry VIII. may be seen in prints of the time; plain russet coats, and a loose kind of kersey breeches, with stockings of the same piece, were the ordinary suit; and the London apprentices wore blue cloaks in summer, and gowns of the same colour in winter, as badges of servitude; for this appears to have been the age of domestic distinctions—the relics of the feudalism of the middle ages. The women wore russet, or long woollen gowns, worsted kirtles (hereafter called *petticoats*), and white caps and aprons; and white underlinen came into general wear. The engraving shews a man and woman in the ordinary dress of this period.

Man and Woman of the Sixteenth Century.

The principal novelty of the reigns of Edward VI. and Mary was the flat round bonnet or cap, of plain velvet or cloth, worn on one side of the head, and decorated with a jewel and single ostrich feather. The bonnet itself is preserved in the caps worn at the present day by the boys of Christ's Hospital; and their blue coat and yellow stockings are such as were worn by the London apprentices at the date of the foundation of the hospital by the youthful Edward. See STOCKINGS.

The male costume in Elizabeth's reign was the large trunk hose, long-waisted doublet, short cloak, hat, band, and feather, shoes with roses, and the large ruff; but the great breeches, 'stuffed with hair-like woolsacks,' after the separation of the hose into this garment and stockings, appear to have been worn throughout the reign: they were made of silk, velvet, satin, and damask. The doublets were still more costly, and quilted and stuffed, 'slashed, jagged, pinched, and laced;' and over these were worn coats and jerkins in as many varieties as there are days in the year. The cloaks were of the Spanish, French, and Dutch cuts, of cloth, silk, velvet, and taffeta of all colours, trimmed with gold, silver, and silk-lace and glass bugles, inside and outside equally superb. The stockings, shoes, slippers, and ruffs resembled those of the ladies.

Hats now began to supersede the bonnets of a former era. Those of beaver were exceedingly expensive, and they were for the most part made of felted wool, dyed. The most remarkable thing about these hats was their numerous shapes: some were steeple-crowned; others were flat and broad, like the battlements of a house; and others with round crowns, and bands of all colours, and ornamented with huge feathers and brooches, clasps, and jewels of great value. See HATS.

As regards female attire, the more conspicuous features in the reign of Elizabeth were the farthingale (q. v.) and ruff. The farthingale, or fardingale, consisted in an extravagant expansion of the lower garments, by means of cane or whalebone, by which the lady seemed to walk in a kind of tub. The farthingale, which is referred to by Shakspeare, Butler, and other writers, mostly in a satiric vein, was the predecessor of the hoop, which in its turn, after an interval, has been succeeded by the Crinoline (q. v.) and hoop-work of steel. The widely extended ruff of fine linen, like a huge frill, is seen in the pictures of Elizabeth and her envied rival, Mary Queen of Scots, both stars of fashion in their day.

Under James I., the male costume was somewhat more Spanish, as respects the slashing and ornamenting of the doublet and breeches. Late in the reign, however, the jackets or doublets were shortened, and the breeches reduced in size, and fastened in large bows at the knees; the well-stockinged leg was admired, and the hat worn low in the crown, and with broad brim, as seen in portraits of the date 1619. Beards and whiskers had become almost universal in the reign of Elizabeth; but in that of James, the former was sometimes worn trimmed to a point, hanging down at the division of the ruff.

In the female costume, there was little change. The farthingale continued to be worn by ladies of quality; a strong passion for foreign lace was introduced; pearls were the favourite jewels; and the ruff maintained its sway, so as to be anathematised from the pulpit; and the fancies of female costume were glanced at in a sermon preached before the king at Whitehall in 1607—1608, as 'her French, her Spanish, and her foolish fashions.'

The fashion of dress in the reign of Charles I. became still more decidedly Spanish and picturesque. There were now worn collars of rich point-lace, large and hanging down on the shoulders, held by a cord and tassel at the neck, and now called *Vandyke*, from its being the most striking part of the dress in which Vandyke at that time painted portraits.

The principal habits were vests and cloaks of velvet, or silk damask, short-trousered breeches terminating in stuffed rolls, and fringes and points, and very rich boots, with large projecting lace tops. A dress of Charles is thus described: A falling band, green doublet (from the armpits to the shoulders wide and loose), zigzag turned-up ruffles, long green breeches (like a Dutchman's), tied below the knee with yellow ribbons, red stockings, green shoe-roses, and a short red cloak lined with blue, with a star on the shoulder; the king sometimes wore a large cravat, and at other times a long falling band with tassels. The dress of the gay courtiers or cavaliers consisted of a doublet of velvet, silk, or satin, with large loose sleeves, slashed, and embroidered; Vandyke collar and band, and short embroidered cloak, worn on one shoulder; the long breeches, fringed and pointed, met the ruffled tops of the boots; the embroidered sword-belt was worn over the right shoulder, and in it was hung a Spanish rapier, and in the flapping beaver-hat was worn a plume of feathers confined by a jewel. A buff coat or jerkin

Citizen in the time of Charles I.

was often worn, as a better defence than the doublet, which is sometimes covered. The engraving represents a citizen of this period more plainly attired.

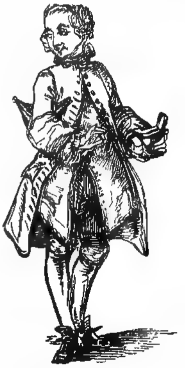
The female costume of this period was rather elegant than splendid. Gowns with close bodies and tight sleeves were worn, though the farthingale was retained, with a gorget ruff standing up about the neck like a fan. French hoods were still worn, though with little distinction as to rank. The hair was worn in small curls, and the hoods, of all colours, fastened under the chin with curious effect. Earrings, necklaces, and bracelets were much worn; but the Puritans forbade the females to wear lace, jewels, or even braided hair; and they retained the close hood and high-crowned hat.

Towards the close of the reign of Charles I., the cumbrous farthingale disappeared, with the yellow starched ruff and band. These tasteless fashions being dismissed, the female dress became very elegant, with its rich full skirt and sleeves, and falling collar edged with rich lace, and the hair worn in graceful ringlets; but these vanities were condemned by the Puritan party.

With the restoration of Charles II. came certain tasteless innovations upon the elegant Vandyke costume of the time of Charles I., which were the first resemblance to the coats and waistcoats of the present day. Thus our most picturesque attire lasted little more than a quarter of a century. Its decline was gradual; its chivalric character soon degenerated into grotesqueness, which in its turn changed to stark meanness. Early in the reign of Charles II., the doublet was much shortened, and worn open in front, where, and at the waistband, the rich shirt was shewn; and the loose sleeves and breeches were decked with ribbons and points, and from the knee-bands hung long lace ruffles. At the wrists, too, ruffles were worn; but the lace-collar was shorn of its points. The cloak was retained upon the left shoulder, and the high-crowned and plumed hat remained for a short time; but the crown of the hat was soon lowered.

The petticoat breeches were another absurdity; although ornamented with ribbons at the sides, the lining strangely appeared below the breeches, and was tied at the knees; to match which, the sleeves of the doublet only reached to the elbows, and from under them bulged the ruffled sleeves of the shirt, both being ornamented with ribbons. Meanwhile the skirt of the doublet had been lengthened from above the waist nearly to the knees, and had buttons and button-holes in its entire length, thus becoming a *coat*, and so named in an inventory of 1679; wherein also are the items of *waistcoat*, *breeches*, *pantaloons*, *drawers*, and *trousers*, being the earliest mention of these articles. Stockings of various kinds were common; and 'the lower ends of stockings' are understood as socks. Instead of the lace-collar was worn the long square-ended cravat, of the same material, from Brussels and Flanders.

Passing to the reigns of James II. and William III., we find the male attire gradually fashioned according to the artificial costume of the court of Louis XIV. Every article of dress was now more prim and exact. The petticoat breeches were exchanged for the close-fitting garments tied below the knee, and therefore called *knee-breeches;* the broad-brimmed hats were turned up on two sides, and edged with feathers or ribbons; we began to see the rich long lace cravat and embroidered waistcoat; and the band was now narrowed, so as to resemble that worn at the present time by clergymen. Wigs, which had been some time in use, were worn still longer than hitherto, hanging down in front, or flowing upon the shoulders, though the colour was altered from black to suit the complexion. From the 17th to the end of the 18th c. was the era of *Hair-powder* (q. v.), *Wigs* (q. v.), and cocked-hats; in these as in other matters there being an excessive artificiality in the tastes of the higher classes. In the annexed cut, we offer a representation of a gentleman of 1750, with his flowing coat and ample cuffs, frills at the wrist, deep waistcoat hanging over the legs, long white hose drawn over the knees, his cocked-hat folded under his arm, and in his hand the open Snuff-box (q. v.). Such was the appearance of what is traditionally known as the 'old English gentleman.' The coats of the 18th c. were of velvet, silk, or satin, as well as broadcloth, and their colours very fanciful. Hogarth's favourite colour was sky-blue; Reynolds's, deep crimson and violet; and Goldsmith rejoiced in plum-colour. About 1790, cloth became the general wear; the waistcoat being of the costlier materials, and embroidered, and sometimes the breeches. Buckles were worn at the knees and in the shoes till the close of the century; and the large square plaited buckle was the *ton* until 1791, when shoe-strings became general. Among the artificialities of dress during the greater part of the 18th c., none was more odious than that of Hoops (q. v.), worn by ladies, who, by these means of expansion, were made to appear as if standing in an inverted tub. In the reigns of George I. and II., a loose kind of drapery at the back of the dress, called a *sacque*, and hooded silk-cloaks, were worn, also a very small muff, such as have been lately revived. In the 18th c., after the disuse of towering head-dresses, Veils (q. v.) of an elegant fabric were introduced, and the Fan (q. v.) was an important article for ornament and flirtation.



Gentleman of 1750.

The formalities of the 18th c. received a severe blow at the French Revolution; and in the ten years from 1790 to 1800 a more complete change was effected in dress, by the spontaneous action of the people, than had taken place at any previous period in a century. The change began in France, partly to mark a contempt for old court usages, and partly in imitation of certain classes of persons in England, whose costume the French mistook for that of the nation generally. This new French dress was introduced by the party who were styled the Sans Culottes. It consisted of a round hat, a short coat, a light waistcoat, and pantaloons; a handkerchief was tied loosely round the neck, with the ends long and hanging down, and shewing the shirt-collar above; the hair was cut short, without powder, *à la Titus*, and the shoes were tied with strings.

The comparatively simple form of dress of the Sans Culottes found many admirers in England, and soon became common among young men; the change from antique fashions was also greatly helped by the imposition of a tax on the use of hair-powder, which was henceforth generally abandoned. Pantaloons, which fitted closely to the leg, remained in very common use by those persons who had adopted them till about the year 1814, when the wearing of trousers, already introduced into the army, became fashionable. It is proper, however, to mention that trousers had, for the previous fifteen or twenty years, been used by boys, and were perhaps from them adopted by the army. Previous to the French Revolution, the dress of boys was almost the same as that of men. Although trousers—called by the

Americans *pants*—were generally worn after 1815, many elderly persons still held out in knee-breeches against all innovations, and to the present day an aged gentleman may occasionally be seen clinging to this 18th c. piece of dress. The general use of white neckcloths continued, notwithstanding the introduction of the standing collar, till the reign of George IV., when this monarch's taste for wearing a black silk kerchief or stock, and also the use of black stocks in the army, caused a remarkably quick abandonment of white neckcloths, and the adoption of black instead. The year 1825, or thereabouts, was the era of this signal improvement in costume.

While these leading changes were effecting, other alterations of a less conspicuous nature were from time to time taking place. The disbanding of the army after the peace of 1815 led to various transformations besides those we have mentioned. While pantaloons were the fashionable dress, it became customary to wear Hessian boots; these, which had originated among the Hessian troops, were without tops, and were worn with small silk tassels dangling from a cut in front; being drawn over the lower part of the pantaloons, they had a neat appearance; but the keeping of them clean formed a torment that prevented their universal use. See BOOTS. When trousers were introduced from the practice of the army, the use of Wellington boots to go beneath them also became common. Referring to the era of 1815 to 1825 as that in which trousers, Wellington boots, and black neckcloths or stocks came into vogue, we may place the introduction of the surtout in the same period of history. From the time when the collarless and broad-skirted coat had disappeared about the commencement of the century, the fashion of coats had changed in various ways till the above-named era, when the loose frock-coat or surtout was added to the list of garments.

Such is a general account of the progress of fashions in England until nearly the present day. In these fashions, the Welsh, Irish, and Scotch have participated, and there is now little to distinguish the inhabitants of one part of the United Kingdom from another. What differences exist in particular localities—as, for instance, the round hats of the women in Wales, the checked gray *plaid* of the Lowland Scottish peasantry, and the *kilt* of the Highlanders—will receive some notice under their appropriate heads.

The general simplifying of dress subsequent to 1815, was not unaccompanied by an expiring effort to sustain a high style of fashion. The *macaroni*, or highly dressed beau of the 18th c., was now succeeded by the *dandy*, who, with mincing, affected manners, prided himself on his starched collars, his trouser-straps, and the flashy bunch of seals which dangled from his watch-chain. The Regency was the era of this kind of supreme dandyism, but it continued till later times, and characterised a number of leading public personages, of whom notices occur in Raikes's *Reminiscences*, from 1831 to 1851. In the present day, may be noted a kind of breakdown of everything like formality in gentlemen's walking costume. Plain cloths, of divers hues, called Tweeds (q. v.), have almost superseded materials of a superior quality; cloth caps, or soft felted hats, called *wide-awakes* (see HATS), cover the head; and the feet are provided with short ankle-boots instead of Wellingtons. In evening or dinner costume, however, the old etiquette of dress-coats and white neckcloths is still maintained. Among the changes that are taking place in the morning or walking dress, none is so remarkable as the growing fashion of wearing *knickerbockers*. These are wide loose trousers to below the knee, leaving the lower part of the leg only stockinged or covered with leggings. This fashion, which has been copied more immediately from the French Zouaves (see ZOUAVE), and partly perhaps from the common practice of stuffing the lower parts of the trousers roughly into boots in the western regions of the United States, is very much a resumption of the costumes seen in old Dutch prints. Should it become general, leg-gaiters or boots will come again into use, and the present generation may live to see the fashion of male attire work once more round to the knee-breeches of the 18th century. In female as well as in male costume, fashion seems to have a tendency to work in a circle; of this, the resumption of the farthingale, or hoop, under the name of crinoline, already referred to, offers a sufficient example, besides affording a ludicrous instance of the unreasoning manner in which extravagances in dress are usually followed. It is to be observed, however, that Englishwomen, chargeable as they are with this absurdity, set a most creditable example to their sex all over the world, in allowing no fantastic change of fashion to prevent them from taking outdoor exercise in all weathers, to which the recent introduction of india-rubber Goloshes (q. v.) has materially aided.

As to the moral view that may be taken of the whimsicalities of female fashions, we might refer to the numerous papers of Steele in the *Tatler* and *Spectator*, and also the writings of other 18th c. essayists; passing these over, it is enough to quote the words of Hazlitt, a more recent essayist. 'Fashion,' he says, 'constantly begins and ends in two things it abhors most—singularity and vulgarity. It is the perpetual setting up and then disowning a certain standard of taste, elegance, and refinement, which has no other formation or authority than that it is the prevailing distraction of the moment; which was yesterday ridiculous from its being new, and to-morrow will be odious from its being common. It is one of the most slight and insignificant of all things. It cannot be lasting, for it depends on the constant change and shifting of its own harlequin disguises; it cannot be sterling, for, if it were, it could not depend on the breath of caprice; it must be superficial, to produce its immediate effect on the gaping crowd; and frivolous, to admit of its being assumed at pleasure by the number of those who affect to be in the fashion, to be distinguished from the rest of the world. It is not anything in itself, nor the sign of anything, but the folly and vanity of those who rely upon it as their greatest pride and ornament. It takes the firmest hold of weak, flimsy, and narrow minds, of those whose emptiness conceives of nothing excellent but what is thought so by others. That which is good for anything is the better for being widely diffused. But fashion is the abortive issue of vain ostentation and exclusive egotism: it is haughty, trifling, affected, servile, despotic, mean and ambitious, precise and fantastical, all in a breath—tied to no rule, and bound to conform to every rule of the minute.' For a large variety of amusing particulars concerning fashions, 'stars of fashion,' &c., during the past two centuries, we refer to Mrs Stone's *Chronicles of Fashion* (Lond. 2 vols. 1845). W. C.

FAST (a word common to the Teutonic tongues, which Grimm derives from a root signifying primarily to hold, keep, observe, and hence to restrain one's self; Lat. *jejunium*, Gr. *nēsteia*, Hebr. *tsom*) is the word used to express a certain self-imposed restraint with respect to the nourishment of the body. The abstinence enforced may be either partial, when the restriction is confined to certain articles of food; or total, when all sustenance is dispensed with for a specified time. The origin of the custom seems to be coeval with man's first experience of the salutary influence which abstinence exercises on the health, and with his more or less instinctive consciousness of the necessity of retaining the body in due subjection to the soul. By degrees, the self-mortification which it implied raised it into a sacrifice offered to the Deity; it became a religious observance, was surrounded with rites and ceremonies, and finally bore the stamp of a divine law. Climate, the habits of a people, and their creed, gave it at different periods different characteristics; but it may be pronounced to have been a recognised institution with all the more civilised nations, especially those of Asia, throughout all historic times. We find it in high estimation among the ancient Parsees of Irania. It formed a prominent feature in the ceremonies of the Mysteries of Mithras; and found its way, together with these, over Armenia, Cappadocia, Pontus, and Asia Minor, to Palestine, and northward to the wilds of Scythia. The ancient Chinese and Hindus, and principally the latter, in accordance with their primeval view—which they held in common with the Parsees—of heaven and hell, salvation and damnation, of the transmigration of the soul, and of the body as the temporary prison of a fallen spirit, carried fasting to an unnatural excess. Although the Vedas attach little importance to the excruciation of the body, yet the Pavaka, by the due observance of which the Hindu believer is purified from all his sins, requires among other things an uninterrupted fast for the space of twelve days. Egypt seems to have had few or no compulsory general fasts; but it is established beyond doubt, that for the initiation into the mysteries of Isis and Osiris, temporary abstinence was rigorously enforced. In Siam, all solemn acts are preceded by a period of fasting, the seasons of the new and full moon being especially consecrated to this rite. In Java, where abstinence from the flesh of oxen is part of the religion of all, Buddhists and worshippers of Brahma alike, the manner and times of the observance vary according to the religion of the individual. Again, in Tibet, the Dalai-lamaites and Bogdo-lamaites hold this law in common. That Greece observed and gave a high place to occasional fast-days—such as the third day of the festival of the Eleusinian mysteries, and that, for instance, those who came to consult the oracle of Trophonius, had to abstain from food for twenty-four hours—is well known. It need hardly be added, that the Romans did not omit so important an element of the festivals and ceremonies which they adopted from their neighbours, though with them the periods of fasting were of less frequent recurrence. See THESMOPHORIA.

As to the Semitic races, although we find the people of Nineveh undergoing occasional fasts, to which even animals were made to conform, yet the Mosaic law set apart one day only in the whole year for the purpose of fasting. The 10th day of the seventh month (Tishri), called 'the Day of Atonement' (Yom Kippur), or, as the holiest of the whole year, 'the Sabbath of Sabbaths,' was ordained for 'the chastening of the *Nephesh*,' which the traditional law explains as meaning the strictest and most rigorous abstinence from all food or drink, as also from washing, anointing, the putting on of sandals, &c., from the sunset of the ninth to the rising of three stars on the evening of the tenth day. In process of time, five days of compulsory fasting were added, in commemoration of certain days of humiliation and national misfortune—viz., the 17th of the fourth month (Tamus), as the anniversary of the taking of Jerusalem both by Nebuchadnezzar and Titus; the 3d of the seventh month (Tishri), when Ishmael had killed Gedaliah, the Jewish governor appointed by the Babylonians (Jer. xli. 2); the 10th of the tenth month (Tebeth), in remembrance of the siege of Nebuchadnezzar; the 13th of the twelfth month (Adar), the fast of Esther, and the day most rigorously kept, next to the great Day of Atonement:—the 9th of the fifth month (Ab), the anniversary of the destruction of the first temple by Nebuchadnezzar, and of the second by Titus. That the people had at all times been prone to attach great importance to the use of this penance as a visible sign of outward contrition, is clear from that ordinance of the Mosaic law which puts into the hands of the head of a family the power of confining self-imposed vows of abstinence within due limits. The community loved to express their penitence for sin, or their grief on the death of great men, by occasional fastings. They were also considered an efficient means of averting the divine wrath, of insuring victory over an enemy, or of bringing down rain from heaven. Besides, fasting was not unfrequently resorted to by those who wished to free their minds from all hindrances to meditation, as in the forty days of Moses (Exod. xxxiv. 28), or the fast of Daniel (Daniel, x. 2 and 3). This fast of Contemplation, as it might be called, seems also to have been the model imitated by the Cabbalists, some of whom are known to have fasted from Sabbath to Sabbath. In later times, when, after the destruction of the temple, sacrifices had ceased, fasting, as causing a decrease in the flesh and fat of the individual, was considered to be in some degree a substitute for the animal which had formerly been offered up by the priest. From a means to repentance and inward purification, which purpose alone it had been originally intended to serve, it became an end and a virtue in itself; an abuse, indeed, neither unknown nor undenounced even in the days of the prophets. If we add to this the endless chain of dire calamities and ever-renewed persecutions of which the Jews have been the victims for many a long century, the ever-increasing number of their fasts commemorative of deaths and tribulations will be far from surprising. Most of these, however, which were superadded from time to time, soon fell into oblivion. Over and above the six already mentioned, but few entire days are now observed by the orthodox, and these merely of a local character. Fasting, with the Jews, always implies entire abstinence, and lasts, except on the Day of Atonement and the 9th of Ab—when the sunset of the previous evening is the sign for its commencement—from the break of the day to the appearance of the first three stars. Sackcloth and ashes, the garb of the penitent in ancient times, are no longer worn; but as the special holiness of the Day of Atonement is celebrated by various solemnities (see FESTIVALS), so the deepest mourning over the loss of temple and country is visibly expressed by many ceremonies in the Jewish synagogues and homes on the 9th of Ab. On that day also, to add the individual to the national sorrow, the cemeteries are generally visited (see JEWISH RITES). Of several half-days of fasting that have survived, we will mention the first two Mondays and the first Thursday in the second month (Iyar) and in the eighth month (Cheshwan), (sheni vachamishi vesheni), in celebration of the two meeting-points of summer and winter; as also, several days before the New-year or Day of Judgment, and before the Day of Atonement. The individual is bound to celebrate by fasting the anniversary of the death of his parents, his own wedding-day until the performance of the marriage-ceremony, and the birth of his first-born male child (up to its thirteenth year—when the duty falls upon the latter himself), on the day preceding the Pesach (Pasha)

—in commemoration of the sparing of the Israelite first-born in Egypt. For the several hours' fasts on the two New-years' Days, and on the first six days of the Feast of Tabernacles, we refer likewise to FESTIVALS, and we will only add in conclusion, that the Sabbath causes the postponement of any fast—that of the Day of Atonement only excepted—which may happen to be coincident with it; and that children—girls up to their twelfth, boys to their thirteenth year—pregnant women, and the sick, are exempted from the observance.

In the time of Christ, fasting, as we have seen, was held in high estimation. The Mondays and Thursdays—the market-days, on which the judges sat, and the law was read in the synagogues—were especially set aside for this purpose by the Pharisees. The Essenes fasted even more frequently. The Sadducees alone took exception to this rite, and were therefore considered ungodly. Christ himself neither approved nor disapproved of the custom, but, as in all matters of ceremony, allowed his disciples, Jews and Gentiles, to act according or contrary to their old habits. He is distinctly against such a *commandment*, and even excuses those who did not fast. His own abstinence from food for forty days was like that of Moses, entirely an individual act; and against a voluntary and limited imitation of such abstinence, to which the spirit might move a man, no objection whatever was to be taken.* During the first centuries of Christianity, these voluntary fasts were frequent enough; the new converts adhering in most cases to their old rite, and only taking care to change the days, which had been days of abstinence in their former religions, for others. Besides, they were considered a befitting preparation for holy acts and feasts, for ordination and baptism. The time mostly celebrated annually in common by all were the forty hours from Friday afternoon to Sunday morning, during which time Christ lay in the sepulchre. But not before the end of the second century was anything like an ordinance promulgated with respect to fasting in the new religion. It was first Montanus who, as the Paraclete, introduced, among other laws of excessive severity and rigour, fasting, as an inhibition upon the faithful. The Wednesdays and Fridays, as the days when Christ was taken prisoner and crucified, were made days of strictest abstinence from all food; while on the other days of the week, dried, uncooked victuals only were allowed. Asceticism and monachism had their share in the gradual development of the doctrine of the necessity of mortifying the flesh, and as a natural consequence, in the growth and diffusion of the custom of fasting. Yet, in the first six centuries, the difference in the various Christian communities was not greater in any other doctrine or ceremony than in this. Bishops and councils, however, gradually fixed the times and seasons for the whole of Christendom. The 40 hours had gradually become 40 days, called the Quadragesima; and the Council of Orleans, in 541, made it binding upon every Christian not to eat any meat during this time, save only on the Sundays.* The eighth council at Toledo, in the 7th c., declared those who ate meat during Lent, sinners unworthy to partake in the resurrection. From the 8th c. to the 11th, when a gradual reaction set in, the laws of fasting and the punishments awarded to the transgressors became stricter and stricter; interdict and excommunication were among the penalties. By degrees they had become so numerous and different in kind, that they were divided into—1. Jejunium generale (a fast binding for all); 2. Consuetudinarium (local fast, &c.); 3. Penitentiale (atonement for all transgressions); 4. Votivum (consequent upon a vow); 5. Voluntare (for the better carrying out of an undertaking). These, again, were kept either as 1. Jejunium naturale (an entire abstinence from food or drink, especially in preparation for the reception of the Eucharist); 2. Abstinentia (certain food only being allowed, but several times a day); 3. Jejunium cum abstinentia (the same food, but which must be taken once a day only); and 4. Jejunium sine abstinentia (all kinds of food, but only once a day). The food prohibited on partial fast-days included, during certain periods, not only the flesh of quadrupeds, fowl, and fish, but also the 'lacticinia'—i. e., all that comes from quadruped and bird, as butter, eggs, milk, &c. We cannot here enter into detail; the discrepancies and differences of opinion with respect to the times and modes of fasting, or to the food prohibited, being, even among successive popes and contemporary bishops and elders of the church, so numerous, and involved in such obscurities, that the church historians themselves shrink from enumerating them. Suffice it to say, that they gradually developed in the Roman Church into—1. Weekly fasts, of which Friday, as the day of the crucifixion, seems to have been early and generally observed. To this was added the Wednesday, as the day on which the death of Christ was resolved upon. These two days received the name of Stations; a term borrowed from the *stationes* of the Roman soldiers, in accordance with the views held by the ascetics and monks, that they were the warriors of Christ. At a synod in Spain in the beginning of the 4th c., the Saturday was superadded, but this innovation met with great opposition, especially in the East, where Jewish notions regarding the Sabbath had obtained a more permanent recognition. 2. Vigils, originally night-services observed by the first Christians on the eve of Sundays and festivals, partly in imitation of the Jewish custom of celebrating the entrance of the sabbath and of festivals on the evening of the previous day, and partly in fear of the danger to which a service in the daytime would have exposed the early converts. Although these night-services became unnecessary in the course of time, they were still continued up to the 4th c., when, owing to the abuses to which they led, they were abolished, or rather transformed into fast-days, kept on the eve of great festivals in honour of Christ, Mary, Saints and Apostles. 3. The great or 40 days' fast (Quadragesimal fast), the most important and most rigorously enforced of all. The 40 hours of fast, in commemoration of the 40 hours during which Christ's body lay in the tomb, gradually expanded to 36, or rather 40 days, as mentioned before, in pious allusion to the 40 days of Moses, Elijah, Christ, the 40 years' sojourn in the desert, or the 40 camps—all considered typical, and the fasting became severer the nearer Passion-week itself approached, in which many other signs of mourning and contrition were generally exhibited. 4. The Quatember fasts on the Wednesdays, Fridays, and Saturdays in one week of each season, in imitation of the four Jewish fasts in the 4th, 5th, 7th, and 10th month.—There were still many other fasts, such as those of ordination, &c., but as they had only a temporary existence, we cannot treat of them here. Nor can we enter into the various dispensations granted by the church, or the special pastoral letters generally issued before Quadragesima, nor into the variations in the observance of fasts and fasting in our own days; we can only add, that they have in a great measure lost their former severity, and that only partial abstinence is the rule in all cases. The opinion held by the church in former days, that fasting is meritorious, and conducive to the salvation of the soul, has undergone no change.

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* Roman Catholics, however, maintain that all the words of our Lord, which to Protestants appear to discountenance the obligation of fasting, are directed exclusively against the ostentatious and self-reliant fasts of the Pharisees. They even understand the language which he used in condemning the practice of the Pharisee fasters, as containing a direct exhortation to his own disciples—not that they should abstain from fasting—that they should fast with suitable dispositions. They hold, moreover, that in exempting his disciples from fasting, he had regard only to the actual time of his own presence among them. It was incongruous, he said, that the children of the marriage should fast as long as the bridegroom was with them; but, he added, 'the days will come when the bridegroom shall be taken away from them; *and then they shall fast in those days*' (Mark iii. 20; Matt. ix. 15). Hence they infer, that from the time of our Lord's ascension the practice of fasting became obligatory on his disciples, the temporary cause of the exemption hitherto existing having ceased.

* It is only just to add, however, that here again Catholics dissent strongly from the Protestant view of this history. They admit that the followers of Montanus did introduce greater rigour and frequency into their fasts; but they deny that before the time of Montanus the practice of fasting was not fully recognised in the Christian Church, and regarded as strictly obligatory. The very earliest allusions to the forty days' fast of Lent (*tessaracosté*) regard it as an established and recognised institution. The very first fathers who allude to it, speak of it as 'handed down and observed by the church;' and so far is its origin from being ascribable to the influence of Montanism, that, on the contrary, the earliest relaxations which the church admitted were a reaction against the excessive and intolerable rigour of that fanatical sect.

With respect to the Greek Church, we have to observe that fasting was and is kept with much greater severity, the non-observance of it being the least venial of sins. The days here extend over almost three-quarters of the year. The principal ones are the Wednesday and Friday—with a few exceptions—throughout the whole year; the great Easter fast, lasting 48 days; that of Christmas, 39 days; that in honour of the Virgin, 14 days; and that of the Apostles, beginning on Monday after Trinity, and extending to the 29th of June. Besides those smaller fasts of preparation, which correspond to the vigils of the Roman Church, they have many more occasional fasts, which we, however, must omit here.

The Church of England considers fasting a praiseworthy, but by no means obligatory custom. According to Hook's *Church Dictionary*, the distinction between the Protestant and the Roman Catholic view of fasting consists in this, that the Roman Catholic regards the use of fasting as an imperative means of grace, the Protestant only as a useful exercise preparatory for the means of grace. In proof how much the Church of England has left the question of fasting to the conscience and discretion of her members, it may be observed that she has neither defined the mode or degree of fasting, nor anywhere given a positive command to fast. It has been remarked that no bishop of the Church of England has in an episcopal charge laid down fasting as a positive requirement. The days named by the English Church as seasons of fasting or abstinence, are the forty days of Lent (q. v.), including Ash Wednesday and Good Friday; the Ember (q. v.) days; the three Rogation (q. v.) days, and all the Fridays in the year (except Christmas Day) and the eves or vigils of certain festivals.

The Scottish almanacs contain lists of the *fast-days* of all the principal places in Scotland. These are generally one in each year, appointed by the kirk-session of the Established Church of the parish, or by concurrence of kirk-sessions in towns, but generally by use and wont fixed as to their date. The fast-day is always some day of the week preceding the *Communion Sunday*, or Sunday set apart in the Presbyterian churches for the dispensation of the Lord's Supper. It is usually appointed as a day for 'fasting, humiliation, and prayer.' Business is generally suspended, shops shut as on a Sunday, and churches opened for public worship. By an act of parliament passed not many years since, factories are prohibited from carrying on work on the parish fast-day, but in consequence of the ecclesiastical divisions in Scotland, it has become more common than it once was for agricultural and other kinds of work to be carried on. The fast-day of a large town is always a busy day on the railways, many taking advantage of it for excursions, and making it a day of amusement; too many, also, a day of dissipation and revelry. That it is right to keep up the annual fast-day in these circumstances is doubted by many who themselves conform to its religious observance, although of that observance *fasting* does not now generally form a part. Many, however, doubt if it ever was a good institution; alleging that it is inconsistent with the frequent celebration of the Lord's Supper, which they deem right and desirable, and to which there is a growing tendency. The Scottish Reformers, as appears from the *First Book of Discipline*, contemplated the ordinary celebration of the Lord's Supper at least once a month; and the fast-day, as it now exists in Scotland, derives its origin from a later period.

A few words remain to be said of the Mohammedan fasts. Islam, as an offspring of Judaism and Christianity, adopted this custom with many others from both churches. During the whole month of Ramadan, in which the Prophet brought the Koran from heaven, eating, drinking, smoking, smelling perfumes, &c., are strictly forbidden from daybreak till sunset; for the intervening nights, however, all these restrictions are removed. There are, besides, many voluntary fasts, expiatory like the 10th of Moharram, corresponding to the Jewish Day of Atonement, or for the averting of the Divine wrath in sudden calamities, or as an indemnification for the omission of certain pious acts, as the pilgrimage, &c. See JEWS, MOHAMMEDANISM, MONKS.

Besides the *Bible*, *Schulchan Aruch*, *Koran*, and the Fathers generally, we refer to the following authorities on this subject: Bingham, *Orig.* vol. ix. 1, 21; Fabricius, *Bibliogr. Antiquaria*, c. 11; J. A. Muratori, *De Quatuor Temporum Jejuniis*, &c.; J. Dallœus, *De Jejuniis et Quadragesima*, 1654; Schöne's *Geschichtsforschungen*, Th. 1; *Briefe über d. Gottesd. d. morgenl. Kirche*, von Dr E. v. Muralt (Leip. 1838); Siegel, *Altchristl. Alterthümer*; Dassel, *De Jure Tempor. Quadrages.*, 1617; Walch, *De Jejunio Quadragesimali* (Jenæ, 1727); Homborg, *De Quadragesima Veterum Christianorum et ritibus in ea quondam usitatis diss. qua etiam de recentior. Papist., Græc., Russ., Syrian., Georgian., Maronit., Jacobit., &c. disseritur* (Helmst. 1677).

Fasting, or deprivation of food, is, in a physiological sense, a state inconsistent with the continuance of life in most warm-blooded animals more than a few weeks. If water is not supplied, the period is much shorter, being in man commonly not more than a very few days, or at most a week. Persons have been found in coal-pits and mines, and in other situations where access to food has been impossible, but where water could be had, as long as six weeks after their seclusion, still alive, though of course in a very feeble condition; and a very small daily allowance of food has supported life longer than this, as in some cases of shipwreck, and other accidents at sea. Cases of alleged fasting, longer than this, as in the notorious woman of Tutbury, are certainly in most instances due to imposture. The insane would appear, in some instances, to bear fasting better than the healthy. Hybernating animals (see HYBERNATION) are capable of sustaining the want of food for an apparently indefinite period of weeks during the winter sleep; but no warm-blooded animal can endure fasting in anything like the same degree as the reptiles, in many of which, indeed, the natural state of existence is one of long intervals between the times of taking food, and in which the vital change of texture is remarkably slow. Thus, the remarkable amphibious animal, the *Proteus anguinus*, has been known to live for years without food, and the same is true of salamanders, tortoises, and even goldfishes. In fasting, the body gradually emaciates, most of the secretions are arrested, or greatly diminished, and at last the animal heat falls rapidly in all parts of the body. In attempting the recovery of persons reduced by fasting, food must be given in very small quantities at a time, and of the most nourishing and digestible quality; stimulants should be either withheld, or very cautiously administered. The most important point, next to the regulation of the food, and sometimes even before food is given at all, is the removal of the torpor and chill of the body by gradually applied heat, with friction of the limbs. See Tiedemann's *Physiology;* Burdach's *Physiology;* Chossat, *Recherches sur l'Inanition.*

FAST AND LOOSE is the name of a cheating game, also called *Pricking at the Belt*, which appears to have been much practised by the gipsies in the time of Shakspeare. The following is a description: 'A leathern belt is made up into a number of intricate folds, and placed edgewise upon a table. One of the folds is made to resemble the middle of a girdle, so that whoever shall thrust a skewer into it would think he held it fast to the table; whereas, when he has so done, the person with whom he plays may take hold of both ends, and draw it away.' The game is still practised at fairs, races, and similar meetings under the name of *Prick the Garter;* the original phrase, 'Fast and Loose,' however, is now used to designate the conduct of those numerous slippery characters whose code of ethics does not forbid them to say one thing and do another.

FASTEN'S EVE. See SHROVE TUESDAY.

FA'STI. *Fas*, in Latin, signifies divine law, and *fastus*, anything in accordance with divine law. Hence the *dies fasti*, or lawful days, among the Romans, were the days on which it was lawful to transact business before the prætor. But the sacred books, in which the lawful days of the year were marked, were themselves denominated *fasti*, and the term was employed, in an extended sense, to signify various kinds of registers, which have been often confounded with each other. These registers fall into two principal divisions—the Fasti Sacri or Kalendares, and the Fasti Annales or Historici.

1. *Fasti Kalendares*, or calendars of the year, were kept exclusively by the priests for about four centuries and a half after the building of the city. The appearance of the new moon was proclaimed by a pontifex, who at the same time announced to the people the time which would intervene between the Kalends (q. v.) and Nones (q. v.). See also CALENDAR. On the Nones, the country-people assembled for the purpose of learning from the Rex Sacrorum the various festivals of the month, and the days on which they would fall. In the same way, those who intended to go to law, learned on what days it would be right (*fas*) to do so. The mystery with which this lore was surrounded, for purposes of power and profit, by the favoured class, was dispelled by Cn. Flavius, the scribe of Appius Cæcus, who surreptitiously copied from the pontifical book the requisite information, and published it to the people in the forum. From this, time-tables (*fasti*) became common, very much resembling modern almanacs. They contained the days and months of the year, the Nones, Ides, lawful and unlawful days, &c.; astronomical observations on the rising and setting of the fixed stars, the commencement of the seasons, brief notices concerning the introduction and signification of certain rites, the dedication of temples, the dates of victories, disasters, and the like. In later times, the exploits and honours of the imperial family were duly entered in the calendar. The celebrated *Fasti* of Ovid is a sort of poetical companion to the calendar, as published by Julius Cæsar, who remodelled the Roman year.

Several very curious specimens of fasti on stone and marble have been discovered, of which one of the most remarkable is the Kalendarium Prænestinum, which stood in the lower part of the forum of Præneste, described by Suetonius. Of these ancient fasti, eleven are enumerated by Foggini, a learned Italian antiquary. One of the most interesting is a rural almanac, known as the Kalendarium Rusticum Farnesianum. It is cut on four sides of a cube, each side of which is divided into three columns, each column embracing a month. The various agricultural operations to be performed in each month are given on this curious relic, in addition to the ordinary information contained in these calendars. In the month of May, for example, the rustic is told that his corn must be weeded, his sheep shorn, his wool washed, &c.

2. *Fasti Annales or Historici*, were chronicles, containing the names of the consuls and other magistrates of the year, and an enumeration of the most remarkable events in the history of Rome, noted down opposite the days on which they occurred. From its application to these chronicles, the word fasti came to be used by the poets as synonymous with historical records. A very interesting specimen of fasti of this class was discovered in the forum at Rome in 1547. The fragments into which it had been broken were collected and arranged by the Cardinal Alexander Farnese, and placed in the Capitol, where they may still be seen, together with some additional portions which were discovered in 1817 and 1818. See Smith's *Dictionary of Greek and Roman Antiquities*, *voce* 'Fasti,' and also the article on 'Calendar' (Roman) in the same work.

FAT LUTE is the term applied to a composition of linseed oil and pipeclay. See LUTE.

FA'TA MORGA'NA is a striking kind of mirage observed in the Strait of Messina. A spectator on the shore sees images of men, houses, ships, &c., sometimes in the water, sometimes in the air, the same object having frequently two images, one inverted. See MIRAGE.

FATE, FATALISM, express a conception which has more or less prevailed in all religions. The words are derived from the Latin *Fatum*, which has primarily a passive signification, denoting something uttered—a decree or ordinance. The Greeks expressed the same thought by *Eimarmenē*. *Moira*, again, was the active personification of the idea—the goddess Fate or Destiny. It represented, in the Greek mythology, the final monotheistic element—the vague Unity binding together and dominating over the crowd of Olympian deities. In Homer, *Moira* has a double meaning, appearing sometimes as superior to the will of Zeus, and sometimes as inferior to this will. With the course of Grecian thought, the conception of Fate became more spiritualised. In Æschylus it is an inexorable Destiny; in Sophocles and Plato, it is more of a free and ordering Will. In the later forms of Greco-Roman speculation, again, it undergoes various modifications. With the Epicureans, it seems identical with Chance (*Tuchē*); with the Stoics, it is the very opposite of this. In the one case, the Absolute is a mere blind fatality; in the other case, it is an imminent necessity of reason, governing with iron sway the apparently accidental phenomena of life.

In the two great religions of modern times, Christianity and Mohammedanism, the same conception is found in various forms. In the latter, the Highest is conceived as an arbitrary and inexorable law, swallowing up every lower law of activity, and permitting no scope to freedom of development in human nature. In Christianity and the modern speculation which it has coloured, it shews itself less broadly in the well-known doctrines of Predestination and of Philosophical Necessity. In the Predestination theory of Augustine, Calvin, and many others, the old fatalistic doctrine is repudiated; the recognition of a free determining element in the divine Will, separates their idea of it altogether from that of a mere blind Destiny; but the influence of the mode of thought out of which the old idea sprung, appears in the manner in which the divine decrees are sometimes spoken of as inexorably overbearing human freedom. In the doctrine of philosophical necessity promulgated by Leibnitz, Edwards, and in a somewhat different form by Modern Positivism, the same idea emerges under the name of inevitable sequence—of an invariable connection linking together all phenomena material and mental. An immutable law is declared to pervade and harmonise all existence. This is a much higher conception, but it is not difficult to see how easily it may pass into the old pagan doctrine of Fate.

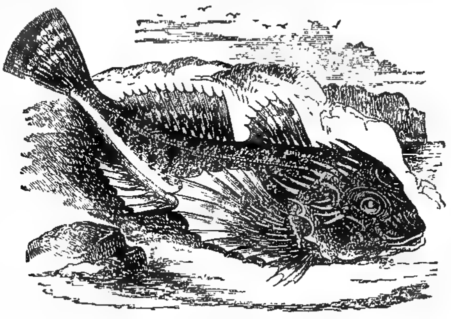
The doctrines of Predestination and of Philosophical Necessity have been supposed mutually to support each other; in reality, however, they are very different doctrines. The one starts from the dominating conception of the divine Will as overruling all things, and approaches fatalism by ascribing in certain cases such an absorbing energy to this Will as to leave no power of free action to any other will. It conceives of everything as swallowed up in the single omnipotence of the Divine. It is *Pantheistic.* The other starts from the dominating conception of law in nature, and approaches fatalism by investing this law with an immutable and self-subsistent character. It looks at all existence as a mere undeviating routine of development, and tends in exact opposition to the other doctrine, to shut out the Divine behind the screen of the Natural. It is *Atheistic.* It is, of course, merely the tendency of the respective speculations that is thus characterised.

The conception of Fate springs irresistibly from man's consciousness of the transcending greatness of what is outside and above his own feeble existence—of the objective Power that encloses and moulds his own subjective activity. As such, it will never wholly disappear from human speculation, however endlessly modified it may be.

FATES. See Parcæ.

FATHER. See Parent and Child, Family, Patria Potestas.

FATHER-LASHER (*Cottus bubalis*), a very common fish on the British coasts, the most spiny of the British species of *Cottus* (q. v.), and particularly armed with strong spines on the back of the head—which is large—and on the gill-covers. When touched, it distends its gill-covers, sets out its spines, and assumes a very threatening appearance.



Father-Lasher (*Cottus bubalis*).

Its general aspect is indeed forbidding, and even the little boys who angle from the rocks and pier-heads are usually averse to touch it, although it is said to be wholesome and agreeable food. It is of a brown colour above, whitish beneath, curiously marbled and spotted, the fins marbled black and white. In Scotland, it bears the name of *Lucky Proach.*

FATHERS OF THE CHURCH (*Patres Ecclesiastici*), certain early writers of the Christian Church. The term Abba, Græcised ἀββας (Father), in use among the Talmudists as a synonym of Rabbi (my master), and constituting, according to Maimonides, the third or lowest honorary title of a Doctor of the Divine Law, was in the first centuries of Christianity applied indiscriminately to all theological writers who were distinguished by their learning, genius, or piety. Gradually, however, the word Father, or, more fully, Father of the Church, was confined to those teachers whose writings were considered pre-eminently orthodox, and who might be looked upon as the *progenitors,* as it were, of certain dogmas, upon the development of which they had exercised a more or less direct influence; while those writers who diverged into the fields of heretical opinion were called simply *Scriptores Ecclesiastici* (Church-writers). Out of the number of the former, some few master-minds, to whom the church owed a still greater tribute, were again singled out as *Doctores Ecclesiæ* (Doctors of the Church), which title of pre-eminence, however, is bestowed on many writers who lived subsequently to the time of the Fathers, in consideration of their 'purer and more excellent doctrine' (Benedict, xiv., *Bulla, Milit. Eccles.*).

The temporal limits within which the Fathers are to be confined, as well as their proper share of authority in matters of faith, have long been points of grave discussion. While some include the Fathers of the 1st c., generally called the Apostolical Fathers, on account of their being the contemporaries or disciples of Christ and the apostles, they are excluded by others; again, by some, the 7th c. is made the closing period, while others carry the list down to the 12th, or even the 13th century.

With respect to the authority of the Fathers, some, like Fredegis, held their words to be as sacred as those of the prophets and sacred writers; while others, like Alphonso di Castro, Melelius Cano, and Cardinal Cajetan, ridiculed the notion that Symmachus should be made equal to St Paul, or Didymus to St John the Evangelist. Others, again, like Pope Gregory and the majority of writers, took the middle course of regarding them not as infallible, much less as prophets and apostles, but held, that when in matters of faith the most perfect and unswerving unanimity reigns among them, then, and then only, the Holy Ghost is to be considered to speak through them. See TRADITION.

Immense as is the range and variety of their writings, ascetic, apologetic, polemical, exegetical, moral, historical, or dogmatical, so also is the diversity of their individual value. Nothing can be further from historical justice than either the wholesale laudation or condemnation of these writers as a body; but whatever stand we may take, we cannot but see that they are of the utmost moment. Stretching as they do over the entire extent of that period which forms the turning-point between the antique and modern world, they faithfully and often unconsciously portray that awful change, of which they were in no small degree the instruments—the gradual wane of old faiths, and of an old civilisation, and the slow and struggling rise of that which was to replace them; while they preserve the most minute and trifling details with the same accuracy as the most momentous event, as each happened to bear upon their subject. The philosopher, the historian, the antiquary, each and all will find their writings, as a whole, to contain an inexhaustible fund of instruction. Of no less interest, perhaps, are their works in relation to the writers individually. These, issuing from all parts of the then known world, from all ranks, all creeds, could not but impress the stamp of their nationality and callings, besides that of their youth or age, vigour or feebleness, upon their writing—Jew, Greek, Roman, African, Spaniard—orator, poet, lawyer, statesman, priest, they all bring with them that which was their own before they embraced the new faith: their dialectic power, their fantastic poetry, their graceful speech, their stern austerity. What Greek subtlety did theoretically for the development of dogma in Origen and Athanasius, that Roman thoroughness did practically for the erection of the hierarchy in Leo the Great and Gregory III.; while from Egypt came asceticism and monachism, the ascendency of spiritualism over sensualism is owing to those who came from the northern coast of Africa. How far Platonism, and especially neo-Platonism, Aristotle and Greek philosophy generally, are found developed in these works, and infused into the new faith by the former teachers of the academies themselves, who mostly retained their old philosophical garb, upon this, as well as upon many other points, we must forbear to enlarge.

We will now proceed to take a brief survey of these writers—referring for further information to the special articles on the more eminent among them. According to the now generally adopted method of dating them from the 1st to the 7th c., they are divided into two distinct periods, the first of which goes down to the Council of Nicæa, 325 A. D. Of those who head the list, the Apostolic Fathers—so called from their supposed connection with Christ and the apostles—very little need be said, as their writings, which are mostly of an ascetical character, have come down to us in a corrupt and mutilated state, and as the writers themselves owe their chief celebrity to the times in which they happened to live. We have here Barnabas, the son of Teostes, and the companion of St Paul (Acts ix. 27; xii. 25); Clement, supposed to have been the third Bishop of Rome; and the Clement mentioned by St Paul (Philipp. iv. 3); Hermas, identical perhaps with the Hermas of St Paul's Epistle to the Romans (xvi. 14); Ignatius, Bishop of Antioch; Polycarp, Bishop of Smyrna; Papias; Dionysius the Areopagite, &c. Next follow the Apologists, or those Fathers whose chief aim was the defence of the new faith against the Roman state, and non-Christian authors, and who were the first to make their scientific culture, and more especially the Platonic philosophy, subservient to Christianity, for this purpose: Quadratus the 'Evangelist,' a travelling missionary; Aristides, an Athenian philosopher; Justin Martyr, the well-known author of the two Apologies and the Dialogue with Trypho (or rather Tarphon); Tatian of Assyria, who, having examined the different forms of worship, as well as the systems of philosophy prevalent in his time, felt satisfied with none but Christianity, and became a disciple of Justin, and a vindicator of the philosophy of the barbarians; Athenagoras, who addressed his Apology to the Emperor Marcus Aurelius, and his son Commodus, and wrote a Defence of the Doctrine of the Resurrection; Theophilus, Bishop of Antioch; Miltiades, &c. Next come the Church Fathers of Asia Minor, men of more practical and peaceful tendencies: Hegesippus, perhaps an Ebionite; Irenæus, Bishop of Lyon and Vienne, who wrote a refutation of the Gnostic system; Hippolytus, his disciple, of unknown birthplace and renowned name. In the North African Church, the development of which is of the utmost moment, inasmuch as its language, dogmas, and laws were adopted by the greater part of the Christian world in the West, we find Tertullian of Carthage, the rhetorician and advocate, a man of profound mind and vast influence; Cyprian, the author of the *Testimonies* in favour of Christ; Commodian, the writer of the *Rules of Living;* and Arnobius, a rhetorician of Sicca, in Numidia. The first comparatively barren, though otherwise highly important church, is the Roman. The pre-eminently practical Roman mind looked more to the outward growth and wellbeing of the church than to literary excellence, and thus we have only two distinguished authors to be noticed here—the Presbyter Caius, known as an opponent of the Montanists; and the Presbyter Novatian, who wrote a treatise on the Jewish laws respecting food. The church which, more than any other, endeavoured to combine speculation with faith, and which gradually became, through its high degree of culture and erudition, the very centre of Christianity, is the Alexandrian. And here we have Pantænus; Clement the Alexandrine, chiefly known by his Stromata or Elements of the Gnosis; Origen, called Adamantinus, the eminent Neo-Platonist, born 185 A. D., in Alexandria, one of the most influential writers of the whole Christian Church; Herculas, with his disciple Dionysius, a liberal and moderate man; Gregory, the worker of miracles; Pamphilus and Julius Africanus, the first Christian chorographer.

In the second period, which dates from the Nicæan Council, and comes down to Gregory II., 604 A. D., a period altogether superior, on account of the great number of intellectual and erudite men who devoted their lives and labours to the church, we have to distinguish the Greek from the Latin Fathers. Among the former, we have again to draw a line between those of the Alexandrine school—like Eusebius Pamphili, the Herodotus of the church; Athanasius, the father of orthodoxy; Basil the Great, Doctor Ecclesiæ, and his brother Gregory of Nyssa; Gregory of Nazianzen, called the Theologian, by way of eminence; Didymus; and Cyrillus, some time Patriarch of Alexandria, the chief prosecutor of Nestorius—and those of the Antiochian school, where we find Ephraem Syrus, 'the prophet of the Syrians;' Cyril of Jerusalem, the converted Arian; John Chrysostom, of brilliant eloquence; Diodorus, Bishop of Tarsus, one of the chief founders of the Antiochian school; and Theodoretus, Bishop of Cyrus. Besides these, we find, of Greek Fathers who belonged to neither school—Epiphanius, the violent adversary of Origen;

Socrates Scholasticus, the continuator of Eusebius's *Ecclesiastical History;* Philostorgius, an Arian Church historian; Logomenus; Evagrius; Macarius the Elder, chiefly known through his miracles and combats with the devil; Procopius of Gaza, the rhetorician; and Joannes Scholasticus, famous through his collections of canonical law. Among the Latins, we have to enumerate first the African Fathers: Fabius Victorinus; Augustine of Tagaste in Numidia, the greatest dogmatist of the Western Church; Pope Gelasius I. (492—496), who finally fixed the canon of the Bible for the Roman Church; and the Bishops Fulgentius, Junilius, and Facundus. Of Spaniards, we have Prudentius the poet; Paulus Orosius, whom Augustine used as his messenger to the East in his controversies with Pelagius. Of Gauls there are Hilarius Pictaviensis, Bishop of Poitiers about 350, the Athanasius of the West; Paulinus of Nola; Sulpitius Severus, friend of Martin of Tours; Vincent of Lerins, once a soldier, who wrote under the name of Peregrinus; Sidonius Apollinaris, Bishop of Clermont; Gennadius, the author of an ecclesiastical literary history; Ennodius from Arles, who exerted himself to unite the Eastern and the Western Church; and Gregorius Turonensis, who wrote *Historia Ecclesiastica Francorum*, the basis of Frankish history. From other countries we have Sedulius, an Irishman; Joannes Cassianus, a Scythian; and Mercator, of unknown birthplace. We conclude with the Italians themselves: Lactantius Firmianus, the Christian Cicero; Julius Firnisius Maternus of Sicily; Ambrose, Metropolite of Milan, who raised his see to such a power that it dared to resist Rome herself up to the 12th century; Rufinus of Aquileia, defender of Origen against the charge of heresy brought against him in the West; Eusebius Hieronymus, undoubtedly the most learned of all the Latin Fathers, and who mastered also the Greek and Hebrew languages, collected in Palestine the most valuable notes for the elucidation of the Scriptures, and also corrected the Latin edition of the Vulgate; Pope Leo I.; Boëthius; Aurelius Cassiodorus, whose *Historia Tripartita*, in twelve books, served for a thousand years as a compendium of ecclesiastical history; the two poets, Arator and Venantius Fortunatus; and Pope Gregory I. (509—604), is regarded by Protestants as having first given the Western Church its peculiarly Roman Catholic stamp by developing the idea of the Eucharist into a Theophany, and making it the centre of the worship. His works, especially his letters, are invaluable for the study of his own times, especially for the history of the conversion of the West.

On the MSS. of the Fathers, we refer to *Petri Lambeccii Commentarii de Bibliotheca Cæsarea Vindobonensi.* The editions of the works of the Fathers are of two classes—those of the individual Fathers, whose writings are the most voluminous and of highest dogmatical importance, and the general Patristic collections, which comprise the writings of the less voluminous or minor Fathers. In the former class, the first place, beyond all dispute, belongs to the celebrated Benedictine editions, by the members of the great Maurist congregation of the French Benedictine order (see Benedictines), of which community the task of editing the Fathers came to be considered as the recognised work. The Benedictine editions of the greater Fathers, with the exception of two or three, still maintain the very highest place in the estimation of the learned. Of the collections of the works of the Fathers (which, for the most part, consist of writers not published separately), the most important are those of La Bigne, Galland, Rössler, Walch, Zimmerman, and Migne, the last still in progress. Cardinal Mai has also made considerable additions to the Patristic collections in his *Bibliotheca Patrum*, *Spicilegium Romanum*, and *Classici Auctores*, as have the Benedictines of Solesme in the *Spicilegium Solesmense.*

FATHOM, a measure of six feet, principally used in reference to marine soundings, and in mines. Originally, a fathom was taken as the width to which the two outstretched arms extended.

FA'TIMIDES, or **FA'TIMITES**, the name of an Arabian dynasty which reigned for nearly two centuries over Egypt. Its founder was Mahadi-Obaidallah, who flourished from 910 to 934 A.D. He asserted that he was descended from Fatima, the daughter of the Prophet, and Ismael, a grandson of Ali. He thus won over to his side all the adherents of the widely diffused Ismaelites, an extravagantly schismatic sect of Mohammedans in Africa, and overthrew the race of the Aghlabides, who ruled at Tunis. His successor extended his dominion as far as Fez, and his descendant, Moëzz, in the year 970, conquered Egypt, expelled the reigning family, removed his court thither, founded Cairo, assumed the title of Calif, thus proclaiming himself the lawful successor of the Prophet, and subdued Syria and Palestine. After the death of Moëzz, the F. maintained their high position for some time; but gradually degenerated, and resigned all the cares of government into the hands of their viziers. Their power now rapidly declined, and their vast territories melted away. In religious matters, the F., because they were raised to power by the followers of Ali, took upon themselves the protection of the Shiite sect, and the establishment of the Ismaelitic doctrines. Between the years 1002—1021, the Calif Hakem-Biamr-Allah persecuted the orthodox Mohammedans or Sunnites, as well as Jews and Christians. He founded an academy at Cairo, and endowed it largely, but connected with it a secret society for the diffusion of Ismaelitic opinions. In the first stages, the novice was shewn the untenable nature of the precepts of the Koran; in the sixth, the advanced student found that religious legislation must give way to the claims of philosophy; in the seventh, a mystic pantheism was proved to be the true philosophy; and finally, in the ninth, the initiated discovered that he was not required to believe anything, and might do whatever he pleased. His system, with considerable modifications, found a home among that peculiar people the Druses (q. v.). After the death of Adhid, the last of the F., in 1171, the founder of the dynasty of the Ayubides, Salâh-ed-dîn (Saladin), took possession of Egypt.

FATS are those oily substances which are solid at ordinary temperature. They do not differ essentially from the liquid oils. See Oils and Fats.

FATS, Animal. There is considerable difference of opinion amongst chemists regarding the exact nature of the fats occurring in the animal body. According to most chemists, they are composed of an admixture of three separate fats—margarine, stearine, and oleine, of which the two former are solid, and the latter fluid, at ordinary temperatures. Heintz, who has carefully studied these bodies, declares, however, that margarine is not a simple fat, but a mixture of stearine and palmitine (a solid fat occurring in palm-oil); and he considers human fat to be a mixture of stearine, palmitine, and oleine. For the chemical characters of these substances, we refer to the articles Margarine, Oleine, Palmitine, and Stearine, and we proceed at once to the consideration of the physiological relations of the fat.

Fat, usually enclosed in vesicles, is found very extensively in the animal kingdom. It is abundant in many larvæ, and occurs more scantily in most insects. It is met with in the mollusca, and is comparatively abundant in all the divisions of the vertebrata. In most fish, it occurs throughout the body, but is especially abundant in the liver, where it is found in the hepatic cells, and not in its own characteristic vesicles. In reptiles, it exists chiefly in the abdomen. In birds, we especially find it about the peritoneum, and under the skin. In mammals, it is very generally diffused, but the greatest quantity is under the skin, in the omentum, and round the kidneys.

The quantity of fat in the human body varies considerably at different periods of life. In the earlier stages of fœtal existence, we find scarcely any fat; in new-born children, there is usually a considerable quantity of this substance deposited under the skin, and the organism continues rich in fat till the age of puberty, when a marked diminution of the substance occurs. It again increases about middle life, and then occasionally occurs in great excess; for example, three or four inches of fat are not unfrequently found under the skin of the abdomen in corpulent persons.

Extraordinary deposits of fat in some particular part of the body are observed in certain races of men and animals. One of the most remarkable examples of this peculiarity is afforded by the Hottentot women, in whom the fat accumulates in the gluteal region to such an extent as to give a most remarkable prominence to that part of the body; and a somewhat analogous deposit exists in a variety of sheep (*Ovis steatopyga*, the fat-buttocked sheep), in which a large mass of fat, sometimes attaining a weight of forty pounds, is developed on the buttocks, and takes the place of a tail.

The origin of the fat in the animal body must undoubtedly be chiefly referred to the fat taken with the food. It has, however, been proved by the most careful investigations on various animals submitted to the process of fattening, on bees fed with cane-sugar, or with honey containing scarcely any wax, and on the larvæ of the insects inhabiting galls, that the animal, like the vegetable organism, has the power of forming or producing fat, far more fat being found, in these experiments, in the body of the animal, than could be referred to the fat taken in the food. The excess must therefore have been formed either from the non-nitrogenous portion of the food, such as starch and sugar; or from the nitrogenous matters, such as fibrin, albumen, &c. In the case of the bees, it was distinctly proved that the fat was formed from sugar; while in the case of the larvæ of the gall-insect, it was similarly shewn that it was produced from the starch which forms the interior of the gall in which the animal lives; and as we have no corresponding evidence of the convertibility of fibrin, albumen, &c., into fat (although such a conversion is by no means improbable), we must for the present regard the non-nitrogenous foods as the chief fat-formers next to fat itself.

The physiological value of the fats is due partly to their physical, and partly to their chemical characters.

The uses of the fat deposited beneath the skin are, first, to protect the body from external shocks by a uniform diffusion of pressure through the whole adipose tissue; and, second, to keep up the heat of the body, by materially checking, through its very slight conducting power, the loss of free heat by radiation. This use of the fat is most clearly seen in some of the lower animals (the seal, whale, &c.), which are exposed to very low temperatures.

Another physical use of fat is to promote the mobility of various organs. Hence, in cases of extreme emaciation, it always remains in the parts where motion is most essential, as the heart, and the orbit of the eye.

Another of its important physical properties is that of rendering other bodies supple, and diminishing their brittleness. In this point of view, the use of fat is very conspicuous in the bones.

The chief chemical use of the fat is its power of exciting and supporting the animal heat. In the oxidation of the fats in the animal organism, whether the process be gradual or rapid, a large amount of heat must necessarily be liberated; and that they are oxidised, and for the most part reduced to carbonic acid and water, is evident, because they neither appear in any quantity in the excretions, nor, as a general rule, accumulate beyond a certain point in the organism. An accumulation of fat thus serves as a reservoir of combustible matter in time of need. This is especially evident in the case of hybernating mammals, as, for example, hedgehogs, in which an enormous quantity is deposited just before the hybernating period: during this period, it gradually disappears, its carbon being slowly consumed in the respiratory process, and keeping up the animal heat.

Fat is, moreover, one of the most active agents in the metamorphosis of animal matter. Lehmann ascertained that a certain, although a small quantity of fat was indispensable to the complete gastric digestion of nitrogenous food, a fact which is confirmed by the observation that in experiments on artificial digestion, the solution of substances used as food is considerably accelerated by the presence of a little fat. The occurrence of fat in the milk and in the egg, as also in all highly cellular organs (as, for example, the liver), is a clear indication that this substance plays an important part in the process of cell-formation; and no animal cell or cell-yielding plasma has ever been observed in which fat is not a constituent.

An undue accumulation or increased growth of the fatty tissue gives rise to the condition known as Obesity (q. v.).

FATTY ACIDS. See Oils and Fats.

FATU'ITY, or **DEME'NTIA**, consists in the impairment or extinction of certain mental powers, or of all. Esquirol has quaintly but descriptively said that the idiot and imbecile are poor who have never been rich, but that the fatuous or dements are rich who have been made poor. This impoverishment is sometimes so extreme, and the sufferer is so little influenced by consciousness as to lose a knowledge of his own existence; and so little by impressions through the external senses, and by the instincts of the sensory ganglia, as to be equally ignorant of the existence of others. Life is vegetative merely. This deprivation may be partial or complete. It may appear as a weakening of sensibility. This is not the tolerance of powerful or painful impressions, or indifference to such, springing from abstraction or engrossment of the attention, but positive extinction of perception; or it may present the more common form of enfeeblement of intelligence, of memory; of the will, where the patient is apathetic, passive, plastic. The disease may involve the affections and the moral sense, and abrogate the power of decision, and all spontaneity of action and thought. Incoherence in ideas and words may be made to constitute another form, although generally regarded as a characteristic; whether it amounts merely to forgetfulness, or to confusion or irrationality, to inconsecutiveness and inability to express instincts and wishes. Delusions and hallucinations may co-exist with these conditions, but, like the real impressions received by this class of the insane, they are feeble, fugacious, and uninfluential. Under all these aspects, the essential element is privation of power; and this is met with as a specific mental disease, arising from obvious causes, unassociated with general alienation, acute in its nature, and rapid in its progress. It is most frequently the disease of youth, of the period of puberty, contemporaneous with growth, with debilitating and exhaustive processes, and depending, in all probability, as in the other forms, upon insufficient nutrition of the brain. At this age, the injury is reparable, and what may be designated juvenile dementia, has the rare distinction of being curable. More frequently, it is the sequel of mania, melancholia, and severe affections of the nervous system. The deterioration here arises from actual changes in the nervous structure, which render healthy nutrition impossible; so that, although mitigation, and sometimes to a marvellous extent, is within reach of treatment, recovery is believed to be impracticable. Again, it is an affection of old age; and although senile dementia may seem but an exaggerated state of dotage, it is accompanied by such marked physical changes, as to leave no doubt that it originates in circumstances differing widely from that gradual degeneration of the tissues which is evidenced by the 'second childishness and mere oblivion.' Lastly, this state may follow fever, when it is transitory, and generally of brief duration.

Fatuity is one of the few morbid mental conditions recognised in our legal code, even by name, as relieving from the consequences of criminal acts, and as disqualifying for the administration and disposal of property. Esquirol, *Des Malad. Ment.*, tom. ii. p. 219.

FAUCHER, Leon, a French publicist and statesman, was born at Limoges, 8th September 1803; studied at first philology and archæology, in which branches of knowledge he acquired some reputation; but about the period of the July revolution (1830), betook himself, with genuine enthusiasm, to journalism and political economy. He became successively editor of the *Temps*, the *Constitutionnel*, and the *Courrier Français*. These functions occupied him from 1830 to 1842, during which period he published many articles on questions of political economy. In 1843, he began to write for the *Revue des Deux Mondes* a series of articles on the industrial condition of England. The whole were collected into two volumes, which appeared in 1845, under the title of *Etudes sur l'Angleterre*, and constitute the most weighty and substantial of all his productions, though Englishmen reckon the author greatly in error in many points. At the general elections of 1846, he was elected for the manufacturing city of Rheims, where his opinions on tariffs were highly appreciated. In the Chamber of Deputies, he voted with the dynastic opposition. A ready but by no means brilliant speaker, he came forward as one of the leading advocates of free-trade, and published in the *Siècle*, and in the *Revue des Deux Mondes*, a number of essays on national economy, characterised by their vigorous and spirited argumentation. After the revolution of 1848, he sat both in the Constituent and Legislative Assemblies for the department of Maine. When Louis Napoleon was chosen president, F. became first Minister of Public Works, and subsequently Minister of the Interior; but when the President proposed to appeal to universal suffrage, F. gave in his resignation, and, after the *coup d'état*, he withdrew from political life. F. died 14th December 1854. A large number of his most valuable contributions to the science of politics will be found in the collection of the *Economistes et Publicistes Contemporains*, and in the *Bibliothèque des Sciences Morales et Politiques.*

FAULT, the term in Mining and Geology for any interruption in the continuity of the strata coupled with the displacement of the beds on either side of the line of fracture. See Dislocation.

FAUN. Faunus was a mythical personage, an ancient king of Italy, who instructed his subjects in agriculture and the management of flocks, and was afterwards worshipped as the god of fields and of shepherds. The festival of the *Faunalia*, held on the 5th December, referred to the protection he exercised over agriculture and cattle. Fauna was his female complement. He was also worshipped as a prophetic divinity. As deity of the woods and of flocks and herds, he corresponds to the Greek Pan: the idea also arose of a plurality of Fauni or Fauns, like the Greek Satyrs, who were represented as monster deities with short horns, pointed ears, tails, and goats' feet, and to whom all terrifying sounds and appearances were ascribed.

FAUNA, a term employed to designate animals collectively, or those of a particular country, or of a particular geological period. Thus, we speak of the fauna of Great Britain, the recent fauna, the fossil fauna, the fauna of the Eocene period or formation, &c. The term bears the same relation to the animal kingdom that *Flora* does to the vegetable. Its derivation is from the mythological fauns, regarded as the patrons of wild animals. In the fauna of any country are included only those animals which are indigenous to it, and not those which have been introduced.

FAURIEL, Claude Charles, a French philologist, historian, and critic, was born at St Étienne, in the department of Loire, 21st October 1772, studied at the College des Oratoriens at Tournon, and afterwards at Lyon, and in 1799 was appointed to a situation under Fouché; but, destitute of all political ambition or predilections, and passionately fond of learned studies, F. resigned his office in 1802, and devoted himself to the calmer pursuits of literature. He made himself familiar with Sanscrit, Arabic, and the treasures of classical antiquity and of the middle ages; and although he did not write much, comparatively speaking, yet the value of what he did write cannot easily be over-estimated. M. Renan may exaggerate when he affirms that F. 'put in circulation the greatest number of ideas' of any contemporary writer; but even the Germans allow that in many points of literary history, criticism, and philology, F. was twenty years in advance of his age. After the July Revolution, he was appointed a professor at the Sorbonne; in 1836, he published his chief work, *Histoire de la Gaule Méridionale sous la Domination des Conquérants Germains* (4 vols., Paris), which is reckoned one of the best specimens of historical investigation and art produced in modern times. Worthy of notice, also, particularly on account of its remarkable historical introduction, is his edition of the Provençal rhymed chronicle, entitled *Histoire de la Croisade contre les Hérétiques Albigeois* (Paris, 1837). F. also contributed several important essays to the literary journals of France, of which, perhaps, the best known was that on the origin of the Epic of Chivalry in the middle ages. He died at Paris, 15th July 1844. Two years after his death appeared a collection of his professorial lectures, under the title of *Histoire de la Poésie Provençale* (3 vols., Paris, 1846), in which F. endeavours, with great erudition and originality of criticism, to shew that to the Provençals must be attributed the composition and primitive development of the greater portion of the romances of chivalry, including those which describe the contests of the Christians and Moors in Spain, and those which form the

Charlemagne cycle, thus finding the origin of the old Spanish and German poetry on the soil of France. F.'s views have, however, met with considerable opposition.

FAUSSE-BRAYE, in Fortification, a low rampart encircling the body of a place, and raised about three feet above the level ground. This work has mostly been discarded by modern engineers, except when used in front of curtains, under the name of *Tenailles* (q. v.). The French engineers gave this title to the work, as an adaptation from the Italian term *Fossa Brea*, which had its origin from the fausse-braye being commonly in the ditch, in front of the main wall. The fausse-braye had the advantage of giving an additional tier of guns for defensive purposes; but the still greater disadvantage of affording facilities for the scaling of the parapet.

FAUSSE RIVIÈRE (in English, *False River*) is a lake of Louisiana, United States, which deserves notice chiefly as an index of the physical character of the country. Till about a century and a half ago, it was a channel of the Mississippi—a fact which probably is still expressed in its name. Here, as in other alluvial formations, the beds of the running waters are undergoing incessant changes.

FAUST, or **FUST**, JOHANN, the chief promoter of the invention of printing, a rich citizen of Mayence, died in the year 1460. See GUTENBERG.

FAUST, DR, according to tradition, a celebrated dealer in the black art, frequently confounded with the preceding, was born at Knittlingen, in Würtemberg, or, as some say, at Roda near Weimar. He flourished during the latter half of the 15th and the beginning of the 16th centuries, and is said to have studied magic at Cracow. After having spent a rich inheritance left him by his uncle, F. is alleged to have made use of his 'power' to raise or conjure up the devil, with whom he entered into a contract for twenty-four years, obtaining during that time his fill of earthly pleasure, but at its termination surrendering body and soul into the hands of the Great Enemy. The devil gave him an attendant spirit or demon, called Mephistopheles, though other names are given him by the later traditionists, with whom he travelled about, enjoying life in all its forms, and astonishing people by working wonders, till he was finally carried off by the Evil One, who appeared in terrible guise, between twelve and one o'clock at night, at the village of Rimlich, near Wittenberg, though several other places lay claim to that very questionable honour. Some have doubted, considering the monstrously mythical form in which his career has come down to us, whether such an individual as F. ever existed; but it is now generally believed that there was a basis of fact, on which tradition has built its grotesque superstructure. Gorres, indeed, asserts that one George Sabellicus, who disappeared about the year 1517, is the real F.; but Philip Melancthon—the man of all the reformers whose word in regard to a matter of fact would most readily be trusted—says that he had himself conversed with Dr Faustus. Conrad Gesner (1561) is equally positive; and Luther, in his *Table Talk*, speaks of Dr F. as a man lost beyond all hope. The opinion that prevails, and which is reckoned to be intrinsically the more probable, is that some man of this name, possessed of varied knowledge, may possibly have practised jugglery (for the wandering savans of the middle ages had all a touch of the quack about them), and thus have been taken by the ignorant people for a dealer in the black art, and one who maintained a secret and intimate relation with evil spirits. His widely diffused celebrity not only occasioned the wonders worked by other so-called necromancers of an earlier age—Albertus Magnus, Simon Magus, and Paracelsus—to be attributed to him, but likewise many ancient tales and legends of a marvellous character were gradually transferred to him, till he finally appears as the very hero of magicians. But while, on the one hand, the narrative of F.'s marvels afforded amusement to the people, on the other, they were made use of for instruction by the clergy, who pointed out, in the frightful fate of F., the danger of tampering with the 'black art;' and the abominableness of a life sunk in sensuality and vice. The myth of F. has received a manifold literary treatment. First come the *Volksbücher* (or people's books), which record F.'s enterprises and feats. The oldest of these now known appeared at Frankfort in 1588. Then came an 'improved' edition of the same, by Widmann, entitled *Wahrhaftige Historien von denen gräulichen Sünden Dr Joh. F.'s* (True History of the Horrible Crimes of Dr John F., Hamb. 3 vols., 1599); and in 1695, a work was published at Nürnberg by Pfitzer, based upon that of Widmann. The oldest of these books was translated into all the civilised languages of Europe. Impostors also published books of magic under the name of F., such as *Faust's grosser und gewaltiger Höllenzwang* (Faust's Great and Potent Book of Spells), *Fausten's Miraculkunst* (Faust's Art of Performing Miracles), and *Dreifache Höllenzwang* (The Threefold Book of Spells). These wretched productions are filled throughout with meaningless scrawls and figures, interspersed with texts from the Bible scandalously misapplied; but in the belief of the vulgar, they were supposed capable, when properly understood, of accomplishing prodigies. That the poetical art should in due time have seized on a subject affording so much material for the fancy to work upon, was inevitable; and consequently, German literature abounds in elegies, pantomimes, tragedies, and comedies on Faust. Since the end of the 17th c., the *Puppenspiel* (Puppet-show) of Dr F. (first published at Leipsic in 1850) has been one of the most popular pieces in Germany. It forms the transition from the rude magic tales concerning F., to the later philosophic conception of the Faust-myth, which has become the most perfect poetical expression of the eternal strife between Good and Evil in the soul of man. The first writer who treated the story of F. dramatically was the English writer Christopher Marlowe, about the year 1600 (German translation by W. Müller, Berlin, 1818); but the grandest work on the subject is Goethe's *Faust*, the first part of which appeared under the title of *Dr F., ein Trauerspiel* (Leip. 1790), and afterwards in a remodelled form, under the title of *F., eine Tragödie* (Tübingen, 1808). The second part was published after the author's death, at Stuttgart in 1833. Besides Goethe's drama, may be mentioned Lessing's masterly fragment, *F. und die Sieben Geister* (F. and the Seven Spirits), G. F. L. Müller's *Dr F.'s Leben* (Dr F.'s Life, Manh. 1778), and Klinger's *F.'s Leben, Thaten, und Höllenfahrt* (F.'s Life, Doings, and Descent into Hell; Petersb. and Leip. 1791). The plastic art has also found a fit subject in Faust. In Auerbach's cellar at Leipsic, where F. is said to have performed many of his feats, are two rude daubs of the year 1525, representing F. and Mephistopheles riding out of the cellar on a wine-barrel. Rembrandt and Christoph von Sichem have also illustrated the story of F., and, in modern times, Cornelius and Retzsch have done the same. See Peter's *Die Literatur der Faustsage* (The Literature of the Faust Myth), 2d ed. Leip. 1857.

FAUSTI'NA, mother and daughter. The former, *Annia Galeria*, usually spoken of as *Faustina Senior*, was the wife of the Roman emperor, Antoninus

Pius, and died 141 A.D.; the latter, known as *Faustina Junior*, was married to his successor, Marcus Aurelius Antoninus, and died at a village near Mount Taurus in 175 A.D. Both, but particularly the younger, were notorious for the profligacy of their lives, which their exemplary husbands in vain endeavoured to check. After their deaths, institutions for the relief of poor girls were founded both by Antoninus and Marcus Aurelius in honour of them, and were called '*puellæ alimentariæ Faustinæ.*' Marcus Aurelius, in his Meditations, speaks highly of his wife, and an attempt has been made by Wieland to defend her against the imputations of the historians of the emperors.

FAUSTI'NUS I., emperor of Haiti, known, before his elevation to the throne, as Faustinus Soulouque, a negro originally of very humble circumstances, was born in St Domingo in 1789. In his earlier years, he acted as servant, and afterwards as adjutant, to General Lamarre. He subsequently served under Presidents Petion and Boyer, and by the latter was raised to the rank of captain. After the year 1844, when the Haitian Republic—of which General Boyer was then president—was dissolved, a struggle for the supreme power ensued, in which F. played an important part. In 1847 he was appointed by the senate President of the Republic. On the 16th April 1848, a dreadful massacre of the mulattoes in Port-au-Prince took place at his instigation. This, and similar measures, struck terror into the hearts of his opponents. In August 1849, he had himself proclaimed Emperor of Haiti, a title which he enjoyed for about ten years; but a revolution having broken out in 1858, and a republic having been declared, F. was forced to abdicate, 15th January 1859.

FAUVETTE, a French name, partially adopted in the English language, for some of the little song-birds of the family *Sylviadæ* or Warblers, having straight slender bills slightly compressed in front, the ridge of the upper mandible curving a little towards the tip, and the legs not long. They mostly belong to the genus *Curruca*, as the Blackcap, the Pettychaps or Garden Warbler, the Whitethroat, &c.; and to the genus *Salicaria*, as the Sedge Warbler, the Reed Warbler, &c. The Dartford Warbler (*Melizophilus Provincialis*) is also called Fauvette. They are all very lively little birds, continually flitting about in pursuit of insects, mostly frequenting bushy places; and some of them, particularly those of the genus *Salicaria*, preferring watery situations where reeds abound.

FAVA'RA, a town of Sicily, in the south of the island, in the province of Girgenti, and four miles south-east of the town of that name. It has rich sulphur-mines, and a population of 11,400.

FAVART, Charles Simon, a French dramatist, was born at Paris 13th November 1710, and first became known by his *La Chercheuse d'Esprit*, performed in 1741. In 1745, he married Mademoiselle Duronceray, herself a dramatic writer of some note, and a singer of remarkable talent, and in the same year became director of the *Opéra-Comique*. The fine taste and judgment of F. and his wife soon obtained for their theatre a great reputation. It was they who made the first attempt to harmonise the costume of the actors and actresses with their impersonations, and to put a stop to the ridiculous practice of decking out soubrettes and country-girls in the attire of court-ladies. So powerful, however, was the opposition excited against them by the jealousy of the other theatres, that the *Opéra-Comique* was closed in the first year of its existence. After some time spent with Maréchal de Saxe during his campaign in Flanders, F. and his wife returned to Paris, where the former continued to write operas. His wife died in 1772, and he 12th May 1793. F.'s success as a writer was very great: he may be reckoned the father of the comic opera, and the happy successor of Le Sage, Piron, &c. The number of his pieces amounts to about 60, of which the most celebrated are *Comment l'Esprit vient aux Filles*, *Le Coq du Village*, *Bastien et Bastienne*, *Ninnette à la Cour*, *Les Trois Sultanes*, and *L'Anglais à Bordeaux*. His works have been published several times. An edition in ten volumes was published at Paris in 1810, under the title of *Théâtre de Monsieur et Madame Favart*. A very interesting book, entitled *Les Mémoires et la Correspondence de Favart*, giving delightful glimpses of the literary and theatrical world of the 18th c., was published at Paris in 1809 by his grandson.

FA'VERSHAM, a municipal borough and seaport in the north of Kent, on a navigable creek, opposite Sheppey Isle, 8 miles west-north-west of Canterbury. It chiefly consists of four streets in an irregular cross. It has a valuable oyster-fishery, employing 200 to 300 persons. It sends much agricultural produce to London by hoys. The creek admits vessels of 150 tons. In the vicinity are some of the most important gunpowder factories in the kingdom. Pop. (1861) 5891. Under the name of Favresfield, it was a seat of the Saxon kings, where Athelstan, in 930, held a Witenagemôte. It has the remains of an abbey founded by King Stephen, where he and his queen, Matilda, are buried. St Crispin is said to have been apprenticed to a shoemaker here. Near F. are some chalk caverns, with columns. In 1860, 2786 vessels, of 165,200 tons, entered and cleared the port.

FAVIGNA'NA, the chief of the Ægades, a group of islands in the Mediterranean, off the west coast of Sicily, lies at a distance of six miles from the Sicilian shore, and is about six miles long, with an average breadth of two miles. It has a town of the same name, with two castles, and a population of 3900. F. is fruitful, has good pasturage, and produces excellent wine.

FA'VOSITES, a genus of lamelliferous corals, found in Silurian, Devonian, and Carboniferous strata. They were social corals, closely packed together, no space being left between the walls of the different corallites. As in the other palæozoic corals, the lamellæ are developed in multiples of four, and the older portion of the stony base is partitioned off by horizontal tabulæ.

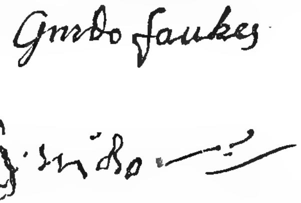
FAVOURS, or **MARRIAGE FAVOURS**, bows of white satin ribbons distributed at marriages in Great Britain, and usually pinned on the breast of all concerned, attendants and postilions included. The favours of those more immediately interested are sometimes enriched with orange blossom. This is an old usage, connected with the love-knot of ancient northern nations, which is not likely soon to disappear; it forms almost the only remaining token of merriment in the nuptial ceremonial. See Brand's *Popular Antiquities*, edited by Ellis, article 'Bride Favours.'

FAVRE, Gabriel Claude Jules, a French advocate and deputy, was born at Lyon, 31st March 1809. He is the son of a merchant, studied for the bar, and passed at Lyon in 1830. His political opinions were and are intensely republican, and when pleading for his clients, in the course of the numerous political lawsuits which he was employed to carry on, F. not unfrequently placed the state solicitors, and even the judges, in a very embarrassing position, by the boldness of his sentiments. As the defender of the *Mutuellists* at Lyon in 1831, he was in danger of losing his life; this, however, did not prevent him from appearing before the House of Peers, in 1834, as the defender of those who had been impeached in April, and commencing his speech with *Je suis Républicain.* Since 1834, F. has been a member of the Paris bar. In the February revolution of 1848, F. was appointed Home Secretary, in which capacity he wrote the notorious circular for which Ledru-Rollin's administration was so severely reproached, investing the commissioners of the republic with dictatorial authority in the provinces. As a member of the Committee of Foreign Affairs, and for some time under-secretary to the same, he took an active part in the labours of the Assembly. After the election of the 10th December, F. shewed himself a persistent antagonist of the President, Louis Napoleon, and after the flight of Ledru-Rollin, became the orator of the Mountain. The *coup d'état* virtually closed his political career. He refused to take the oath of fidelity to the imperial government, and betook himself again to his professional duties. In 1858, he defended Orsini, on his trial for a conspiracy to murder. F. is greatest in political repartee, and though long accustomed to the rough arena of public strife, his language is noted for its Attic elegance. He is the author of several political brochures.

FA'VUS (Lat. a honeycomb), a disease of the skin, chiefly of the hairy scalp, characterised by yellowish dry incrustations of more or less roundish form, and often cup-shaped, composed of the Sporules and Mycelia (q. v.) of a vegetable growth belonging to the order of Fungi (q. v.). The discs of favus are produced with great rapidity, and spread rapidly, if not attended to at the first, over the whole scalp, destroying the bulbs of the hair, which becomes very short and thin, and then falls out altogether. Favus is a disgusting and unsightly, but hardly a dangerous disorder; it is, beyond doubt, contagious, but only spreads where cleanliness is greatly neglected, and is therefore almost unknown among the better classes. It is far more common among children than among adults, and seems to be more frequent in Scotland than in England, and more frequent also on the continent than in either England or Scotland. The cure is sometimes attempted by a variety of medicated and simple ointments, and by pulling out the hair by the roots, or *epilation*, as it is called; but it seems hardly possible in inveterate cases to get rid of the disease without a very long persistence in habits of the most scrupulous cleanliness, and therefore the cure is seldom permanent, though easily attained for the time. Favus is almost always followed by permanent baldness of the parts affected; unlike Ringworm (q. v.), which is a minor disease of the same order.

The Favus fungus, *Achorion Schœnleinii*, is nearly allied to the fungus which has recently proved so destructive to vines, and has by some botanists been placed in the same genus, *Oidium.*

FAWKES, GUY (properly GUIDO), the head of the conspiracy known by the name of the Gunpowder Plot, was born of a Protestant family in Yorkshire, in the year 1570. He became a Roman Catholic at an early age, and served in the Spanish army in the Netherlands. Inspired with fanatical zeal for his new religion, on his return to England, he entered into a plot with several Catholic gentlemen for blowing up the king, his ministers, and the members of both houses at the opening of parliament, 5th November 1605. Guy F. was taken with the burning match in his hand, tried, and after having been put to the torture, was publicly executed January 31, 1606. In remembrance of this event, in most English towns, but particularly in London, a grotesque figure, stuffed with straw, is carried about the streets on the 5th of November, and finally committed to the flames.


Guido fawkes

Guy Fawkes's Signature before and after torture.

A political and religious signification was again imparted to this custom by what was called 'the papal aggression' in the year 1850, when the figure of Cardinal Wiseman (q. v.) was substituted for that of Guy Fawkes.

FA'Y, ANDRÁS, a Hungarian author, was born in 1786, at Kohany, in the county of Zemplén. After having studied philosophy and law at the Protestant college of Sárospatak, F. was called to the bar. He held a situation for some time in the county of Pesth, which, however, he afterwards relinquished, in order to be able to devote himself altogether to literary pursuits. After two volumes of poetry, appeared the collection of Fables (*Mesék*, Vien. 1820), and with the issue of that work F. obtained a decided reputation. The fables are like those of Phædrus and La Fontaine, but in prose. Richness of invention, simplicity of design, and truth of character, are the chief qualities for which the *Mesék* have become a household word among Hungarians. Among F.'s dramatic works may be mentioned the tragedy, The Two Bathorys (*A Két Báthory*, Pesth, 1827); the comedies, Ancient Coins (*Régi Pénzek*), and Hunters in the Matra (*Mátrai Vadászok*). The novel, The House of the Béltekys (*A' Béltéky-haz*, Pesth, 1832), is rather of a didactic kind, but exhibits many features of Hungarian domestic life. Besides these, F. has been a constant contributor to literary and scientific periodicals, and had also his share in some of those pamphlets by which great social questions, as, for instance, female education, savings-banks, &c., were brought to a successful issue in Hungary. In reading F.'s works, we are frequently reminded of Dean Swift. From 1825, which year may be said to have been the beginning of a new political life for Hungary, up to the year 1840, F. was foremost among the leaders of the liberal opposition in the county sittings of Pesth; but on the appearance of Kossuth, the strides of public life growing more and more rapid, F. gradually retired from the region of political controversy, turning his inventive mind to social improvements. The first savings-bank of Hungary (at Pesth) is entirely F.'s work. His literary works were published in eight volumes at Pesth, 1843—1844. He is a directing member of the Hungarian Academy of Sciences.

FAYA'L, one of the most important of the Azores (q. v.), contains about 37 square miles, and about 22,000 inhabitants. As one must infer from such density of population, the island is fertile. In its centre is a mountain 3000 feet in height; and on its south-east coast a convenient bay with good anchorage. Its principal town, Horta, stands on this bay in lat. 38° 30′ N., and long. 28° 41′ W.

FAYETTEVILLE is the name of a flourishing city of North Carolina, United States of America. Standing on the left bank of the Cape Fear River, about 140 miles from its mouth, F. marks the head of its natural navigation; while, by means of locks and dams, it communicates likewise with the upper basin of the river. While the interior sends down coal, the immediate neighbourhood is covered with forests of pine, which are traversed in all directions by 350 miles of plank-road, and yield not merely timber but tar and turpentine. The Cape Fear, moreover, gives abundance of water-power, which is largely applied to the manufacture of cottons and flour. F. has an arsenal of nearly 50 acres in extent, and numbers fully 8000 inhabitants.

FAYÛM, the name of an Egyptian province, surrounded, in the form of a basin, by the Libyan Desert, and connected merely by a narrow valley with that of the Nile, between lat. 29°—30° N., and 30°—31° E. This peculiar depression of the desert extends about 30 miles from north to south, and about 40 miles from east to west, its lowest point lying 100 feet below the banks of the Nile at Benisuef. F. is one of the most fertile provinces in Egypt; producing, in addition to the ordinary useful plants of the country, roses, apricots, figs, vines, olives, &c. in great quantities. This fertility, in a province the soil of which is naturally arid and sandy, is the result of irrigation. A canal from the Nile was, at an early period, carried westward through a gorge in the Libyan hills, which here skirt the western bank of the Nile, and after dividing into numerous branches, lodged its waters in a depression in the north-west, thus forming, it is said, the Lake Mœris (q. v.). The ancient capital of the province, called Krokodilopolis, and at a later period Arsinoë, stood on the eastern shore of Lake Mœris, and upon its ruins stands the present town, Medînet-el-Fayûm, still a place of considerable size, and the chief town of the province.

FEAL AND DIVOT is a Predial Servitude (q. v.) peculiar to the law of Scotland, in virtue of which the proprietor of the dominant tenement possesses the right of turning up and carrying off turf from the servient tenement for the purpose of building fences, roofing houses, and the like. This, as well as the servitude of fuel, implies the right of using the nearest grounds of the servient tenement on which to lay and dry the Turf Peats (q. v.) or feal. These servitudes do not extend beyond the ordinary uses of the actual occupants of the dominant tenement, and cannot be taken advantage of for such a purpose as to burn limestone for sale. They are not included in the servitude of pasturage, but must be constituted either by express grant, or by possession following on the usual clause of parts and pertinents. Ersk. ii. tit. ix. s. 17. The etymology of these words has been much disputed. *Feal* or *fail* is said to come from the Suio-Gothic *wall*, any grassy part of the surface of the ground; and Jamieson derives divot from *delve* (Sax. *delfan* or *delven*), or, as another alternative, says that it may have been formed by the monkish writers of old charters from *defodere*, to dig the earth. The former is the more probable conjecture.

FEALTY (Lat. *fidelitas*) is the fidelity which a man who holds lands of another owes to him, and contains an engagement to perform the services, or to pay the dues, for which the land is granted. It was embodied in an oath, by which the tenant bound himself on entering to the lands. In taking the oath of fidelity, Littleton says, s. 91, that the tenant shall not kneel, nor shall make such humble reverence as in homage. The only object of fealty in modern times is to keep up the evidence of tenure where no other services are due; but even to this effect it has gone into desuetude.

FEAR, MANIA OF, or PANPHOBIA. There are many morbid manifestations of the instinct of cautiousness. Sudden fear in sleep, horrible dreams, nightmare, sleep-walking, have been regarded as symptoms of a special disease. Actual terror from irregular circulation in the sensory ganglia; the sense of falling or drowning in cardiac affections; incubus from disturbance of the circulation in the larger vessels by repletion, plethora, or position, where there is the super-addition of a delusion to the feeling of apprehension—are all allied and distinguished by involuntary and excited cautiousness. It is not only, however, when the intelligence may be supposed to be dormant, and the instincts awake, that such exaggerated fears paralyse minds otherwise sane and sound. Murat, 'the bravest of the brave,' and James I. of England, learned if not wise, were subject to vague, uncontrollable panics, which for a time unmanned them. The condition is often found associated with disease of the heart, as a consequence and concomitant rather than a cause. The presence of the *habitual* dread of evil, the fear of death, the sleepless and breathless anxiety during darkness, or solitude, or silence, as well as the sudden, wild, ungovernable panic, point to the existence of organic or functional diseases of the heart; and conversely, excited or irregular action of the organ, murmurs, angina, lead the astute psychologist to predicate fear as a characteristic of the mental condition. It precedes, and is believed to produce chorea, cancer, and scirrhus. Proximately, however, it depends upon alterations in the capillary circulation, or nervous structure of the brain. Its characteristic is involuntary, irresistible, blind terror, which arises and continues without an adequate cause, and which is not influenced by reason or religion, not even by the removal of the supposed object of alarm. The disease has appeared epidemically during commercial panics, during the horrors of cholera and plague, and in that singular affection called Timoria, which is marked by debility, tremor, and terror, and has been traced to the effects of the damp, unhealthy regions in Sardinia and Sicily, where it exclusively occurs. Panphobia is hereditary, and has been traced through three successive generations. In reviewing the unobtrusive members of an asylum family, the pallid, startled, staring, flickering countenances may be detected as those of patients labouring under fear. They resemble melancholics in pallidity of skin, but in place of courting they shrink from sympathy; though horror-stricken by gloom, they hide in corners, they escape, they shriek in desperation, they climb trees, and apparently inaccessible places; and encounter real in order to elude fancied dangers; or they are motionless, paralysed. They fear and flee from enemies, police, demons, death, punishment; indescribable agonies themselves.—Feuchtersleben, *Principles of Medical Psychology*, p. 281; Arnold, *Observations on Nature, Kinds, Causes, and Prevention of Insanity*, &c., vol. i. p. 257.

FEASTS. See FESTIVALS.

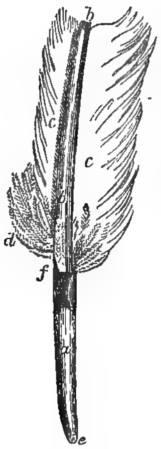
FEATHER, a river of California, and a feeder of the Sacramento, runs through one of the richest gold-fields in the state. It receives the Yuba near Marysville, which appears to mark the head of navigation—the distance down the F. and the Sacramento to the harbour of San Francisco being about 100 miles.

FEATHER GRASS (*Stipa*), a genus of grasses remarkable for the long awns which give a peculiar and very graceful appearance to the species, mostly natives of warm temperate climates. In some of them, the awn is beautifully feathered. This is the case in the best known species, the COMMON F. G. (*S. pennata*), a very doubtful native of Britain, but found on dry hills in the middle and south of Europe. It is a perennial, easy of cultivation, and a favourite ornament of our gardens. When gathered before the seeds are ripe, its feathery awns—sometimes a foot in length—remain attached, so that tufts of F. G. retain their beauty throughout winter, and form one of the most pleasing and familiar decorations of rooms. They are often dyed, to give variety to the decoration, but are never more beautiful than in their natural yellowish-white colour. The feathery awns not only assist in the diffusion of the seed, which is carried by the wind to great distances, but in a very interesting manner help to fix it in the soil. The seed alights vertically, the furrowed base of the awn becomes twisted, so that its furrows form the threads of a screw, the feathery portion becomes horizontal, the wind acts on it, and the seed is screwed into the ground—a reverse action being prevented by stiff hairs which act as barbs.—The Esparto (q. v.) of Spain is nearly allied to the Common Feather Grass.

Feather Grass (*Stipa pennata*).

FEATHERS, a complicated modification of the tegumentary system forming the external covering or plumage of birds, and peculiar to this class of animals. Notwithstanding the varieties of size, strength, and colour, all feathers are composed of a quill or barrel, *a*; a shaft, *bb*; and a vane, beard, or web, *cc*, on either side of the shaft, the vane consisting of barbs and barbules.

The quill by which the feather is attached to the skin is wider but shorter than the shaft, and forms a semi-transparent, horny, cylindrical tube, which terminates below in an obtuse extremity, presenting an orifice termed the lower umbilicus, *e*. A second orifice, leading into the interior of the quill, and termed the upper umbilicus, *f*, is situated at the opposite end, where the two vanes meet and unite. The cavity of the quill contains a series of conical capsules fitted one upon another, and united by a central pedicle; and the whole structure presents a remarkable combination of strength and lightness.



Feather.

The shaft is always of greater length than the quill, and tapers gradually to its free extremity; it is flattened at the sides, is more or less convex on the back, and presents a longitudinal groove inferiorly. It is composed of white, elastic, spongy structure, which is covered by a thin horny sheath.

At the point of junction of the shaft and quill, we usually observe—except on the feathers of the wings and tail—a small supplementary shaft given off, which is furnished with barbs or fibres, and is termed the plumule or accessory plume. In the ostrich it is altogether absent; in the rhea, it is represented by a tuft of down; in the emu, on the other hand, it equals the original feathers in size, so that the quill supports two shafts; and in the cassowary there is a second plumule of considerable size, so that the quill presents three distinct shafts.

The vanes or webs are composed of numerous barbs or small fibres arranged in a single series along each side of the shaft. They are fine prolongations of the outer coat of the shaft, are of a flattened form, and lie inclined towards the apex of the feather, with their flat sides towards each other, and their margins in the direction of the external and internal sides of the feather. The barbs are broader near the shaft than at the free apex, and in the large wing-feathers the convexity of one is received into the concavity of another. They are, however, generally kept in position by the barbules, which are minute curved filaments arising from the upper edge of the barb, much as the latter arises from the shaft. There are two sets of these barbules, one curved upwards, and the other downwards, and those of one barb hook so firmly into those of the next, as to form a close and compact surface. In the ostrich, the barbules are well developed, but are loose and separate, and it is this arrangement which gives to the feathers of this bird their soft, plumous appearance.

Feathers present numerous gradations of structure. In the cassowary, the wings, instead of being provided with ordinary feathers, are furnished with five cylindrical stalks destitute of barbs, so that here we have merely the quill and shaft. On the breast of the wild turkey there is a tuft of feathers resembling long black hair. In the *Dasylophus Cumingii*, the feathers of the crest, breast, and throat are changed, at their extremities, into round, horny lamellæ, looking like shining black spangles; and in the common waxwing or Bohemian chatterer, some of the wing-feathers present at their extremities small horny expansions, resembling red sealing-wax, both in colour and consistence.

Besides the common feathers, the skin of many birds, especially of aquatic species—in which plumules rarely exist—is covered with a thick coating of down, which may be described as consisting of very minute feathers, each of which is composed of a very small soft tube lying in the skin, from the interior of which arises a minute tuft of soft filaments, without any central shaft. This downy covering secures warmth without weight, like the soft fur at the base of the hair of arctic mammals. In most birds, the skin also bears a good many scattered hair-like appendages, which indicate their relations to the ordinary feathers by the presence of a few minute barbs towards the apex.

Feathers are developed in depressions of the skin, lined by an inversion of the epidermis which surrounds the bulb from which each feather springs; they grow, much in the same manner as hairs, by the addition of new cells from the bulb, which becomes modified into the horny and fibrous stem, and by the elongation of previously existing cells. They are, when first formed, living vascular parts, growing by nutrient vessels; but when they are fully formed, the vessels become atrophied, and the feathers become dried up, and gradually die from the summit to the base. For a full account of the development of the different parts, we must refer to Professor Owen's article, 'Aves,' and to Professor

Huxley's article, 'Tegumentary Appendages,' in the *Cyclopædia of Anatomy and Physiology.*

Feathers grow with great rapidity, and in some birds attain a length of more than two feet. They are almost always renewed annually, and in many species oftener; hence it may readily be conceived how much vital energy must be exhibited in their development, and how critical the period of moulting must be. The plumage is generally changed several times before it attains the state which is regarded as characteristic of the adult bird; these changes may occupy a period usually ranging from one to five years.

Notwithstanding their extravascular nature, feathers, as is well known, undergo a change of colour after they are completely formed. In yearling birds, the winter plumage, which succeeds the autumnal moult, gradually assumes brighter tints, the new colour commencing at the part of the vane nearest the body, and gradually extending outwards till it pervades the whole feather. Dr Weinland, an American naturalist, is of opinion, from a comparison of bleached specimens in museums, with recent ones taken from the bird, that the brightness and fading of the colours are due to the increase or diminution of an oily matter. Thus, the microscopic examination of the vane of feathers from the breast of a fresh merganser shewed numerous *lacunæ* containing a reddish oil-like fluid; some weeks after, the same feathers having become nearly white from exposure to light, disclosed air-bubbles instead of the reddish fluid. If this fluid is an actual oil, as is most probably the case, it could make its way into the non-vascular tissue by mere physical imbibition; and on the varying quantities of this oil the variations of plumage would depend.

The property possessed by the plumage of most birds, of keeping the surface protected from moisture, is well known. This is due to two causes. Most birds are provided with an oil-gland at the base of the tail, whose secretion is distributed over the feathers by means of the bill; and, additionally, the shedding of water is partly due to a thin plate of air entangled by the feathers.

The feathers vary in form in different parts of the body, and afford zoological characters for the distinction of species. Hence, they have received distinct names, such as primaries, secondaries, tertiaries, &c., in ornithology. These terms are explained in the article Birds.

The chief uses to which feathers are applied in the arts are three—*pens*, due to the peculiar elasticity of the barrels; *bed-feathers*, due to the combined softness and elasticity of the barbs; and *ornament*, due to the graceful forms and delicate tints of the whole feather. The mode of preparing the barrels for pens is described under Quills.

Bed-feathers were used in England in the time of Henry VII.; but it is not known how much earlier. At the present day, goose-feathers are preferred, the white rather than the gray. What are called *poultry* feathers, such as those of the turkey, duck, and fowl, are less esteemed, on account of their deficient elasticity. Wild-duck feathers are soft and elastic, but contain an oil difficult to remove. The following is one among several modes of preparing feathers for beds. Clean water is saturated with quicklime; the feathers are put into a tub; the lime-water is added to the depth of a few inches; the feathers are well steeped and stirred for three or four days; they are taken out, drained, washed in clean water, dried upon nets, shaken occasionally while drying, and finally beaten to expel any dust. The larger establishments, however, now prepare bed-feathers by steaming, which is found to be a more profitable and efficient process. The *down*, which is of so light and exquisite a texture as to have become the symbol of softness, is mostly taken from the breasts of birds, and forms a warm and delicate stuffing for beds, pillows, and coverlets. The most valuable is that obtained from the eider-duck, described under Eider.

Feathers used for head-dresses, or other purposes of ornament, are selected according to the forms and colours which they display. The *ostrich*, a very valuable kind of feather, may be taken as an example of the way in which ornamental feathers generally are prepared by the *plumassier*. The mode of catching the bird itself is noticed under Ostrich; it suffices here to state that the hunters endeavour to avoid injuring the feathers by blood or blows. When brought to England, the feathers are assorted according to quality; those from the back and above the wings are the best, the wing-feathers next best, and the tail-feathers least valued. The feathers of the male are rather more prized than those of the female. They are cleaned for use by repeated soakings and washings in water, sometimes with and sometimes without soap. There is also a process of bleaching by means of burning sulphur. When dried by being hung upon cords, the feathers pass into the hands of the dresser, who opens the fibres by shaking, gives pliancy to the ribs by scraping them with bits of glass, and curls the filaments by passing the edge of a blunt knife over them. If the feathers, whether of the ostrich or any other bird, remain in the natural colour, little more has to be done; but if a change of tint be required, the feathers easily take dye-materials—such as safflower and lemon-juice for rose-colour or pink, Brazil-wood for deep red, Brazil-wood and cudbear for crimson, indigo for blue, turmeric or weld for yellow, &c. A process of bleaching is adopted before the dyeing, except for black.

The kinds of feathers chiefly used for ornament are those of the ostrich, adjutant, rhea or American ostrich, emu, osprey, egrett, heron, antrenga, bird of paradise, swan, turkey, peacock, argus pheasant, ibis, eagle, and grebe. White ostrich feathers are prepared chiefly for ladies' head-dresses; and black for the Highland regiments and for funereal trappings. The white and gray marabout-stork feathers, imported from Calcutta, are beautifully soft and light, and are in request for head-dresses, muffs, and boas; the white kinds will sometimes sell for their weight in gold. The flossy kinds of rhea feather are used for military plumes, and the long brown wing feathers for brooms and brushes. Osprey and egrett feathers are mostly used for military plumes by Hussar troopers. Bird of Paradise feathers are much sought after by Oriental princes for turban-plumes. Cocks' feathers are used for ladies' riding-hats and for military plumes. Dr Macgowan, who was United States consul at Ningpo a few years ago, has described, in the *American Journal of Science and Art*, an ingenious process which the Chinese adopt for combining brilliant-coloured feathers with bits of coloured metal into garlands, chaplets, frontals, tiaras, and other ornamental articles.

FEBRI'CULA (Lat. a little fever), sometimes called also Ephemera (Gr. a fever of a day), a fever of short duration and mild character, having no distinct type or specific symptoms, by which it can be distinguished and described. See Fever.

FE'BRIFUGE (Lat. *febris*, a fever, and *fugo*, I drive away), medicines calculated to remove or cut short Fever (q. v.).

FEBRO'NIANISM, in Roman Catholic theology, a system of doctrine antagonistic to the admitted claims of the Roman pontiff, and asserting the independence of national churches, and the diocesan rights of individual bishops in matters of local discipline and church government. The name is derived from the *nom de guerre*, Justinus 'Febronius,' assumed by John Nicholas von Hontheim, coadjutor archbishop of Treves, in a work on these subjects, entitled *De Præsenti Statu Ecclesiæ*, which he published in the year 1767, and which, with its several successive volumes, led to a violent and protracted controversy, and elicited the severest censures of the Roman tribunals. See HONTHEIM, GALLICANISM.

FE'BRUARY, the second month of the year, has ordinarily 28 days, but in leap-year it has an additional or intercalary day. Among the Romans, it had originally 29 days in an ordinary year, but when the senate decreed that the eighth month should bear the name of Augustus, a day was taken from February, and given to August, which had then only 30, that it might not be inferior to July. The name is derived from the circumstance, that during this month occurred the Roman festival called the Lupercalia, and also Februalia, from *februare*, to purify.

FE'BRUUS (connected with Lat. *februare*, to purify) was the name of an old Italian divinity, whose worship was celebrated with lustrations during the month of February. The ceremonies instituted in his honour were believed to have the effect of producing fertility in man and beast. F., whose name in the Etruscan language is said to have signified god of the lower world, was also worshipped as such by the Romans, and identified with the Greek Pluto.

FECAMP, a manufacturing town and seaport of France, in the department of Seine Inférieure, is situated in a narrow valley, flanked on either side by steep cliffs, at the mouth of a stream of the same name on the English Channel, 23 miles north-east of Havre. It consists mainly of one long street. Its principal building is the handsome church of Notre Dame, in the early pointed style, and dating from the 14th century. The harbour is frequented by colliers from Newcastle and Sunderland, and by Baltic timber-ships and fishing-vessels. F. has cotton-mills, sugar-refineries, tanneries, ship-building yards, and some linen-cloth and hardware manufactures. Pop. 10,424.

FE'CULA, or **FÆCULA**, is a term applied to starch obtained from various sources, but in France is generally restricted to the starch of the potato. See STARCH.

FECUNDA'TION, or **FERTILISA'TION**, in plants, takes place according to laws similar to those which prevail in the animal kingdom. In plants, however, the organs of reproduction are not permanent as in animals, but fall off—the male organs generally soon after fecundation, the female after the ripening of the seed. The male seminal substance, called *pollen*, never exists in a fluid state, but always in that of granules of various forms (*pollen grains*), which consist each of one cell, whose covering is of various thickness, and contains the impregnating substance. After the dehiscence of the anthers, the pollen gets into contact with the stigma of the pistil, which in its lowest and thickest part (the *ovary* or *germen*) contains the rudiments of the future seeds (*ovules*). The inner layer of the cell-covering of the pollen grain separates from the outer and thicker layer, as if it came out of a bag, and continuing to be elongated by growth, is carried down through the *style* to the germen, where it reaches the *foramen* or small opening of the embryo sac, and comes into contact with the ovule, or even in many cases penetrates into the ovule itself between its cells. By this time, one or other of the cells of the ovule has become considerably more enlarged than the other cells, and what is called the *amnion* has been formed, in the mucilaginous fluid of which (*protoblasma*), after the contact of the pollen-bag, through the dynamic operation of its contents, a *cell-germ* or *cytoblast* is soon developed. This cytoblast is the first commencement of a new and distinct cell, which divides into two cells. These increase, by continually repeated separation of new cells, into a cellular body, which forms the more or less perfect *embryo* of a new plant. If the organ from which the pollen has proceeded, and the organ which contained the ovule, belong to the same plant or to plants of the same species, the embryo arising from this fecundation becomes a plant of the same species. But if the pollen by which the fecundation is effected comes from a plant of another species than that to which the plant belongs in whose germen the embryo is formed, the seed resulting from this fecundation will not, when it grows, produce plants of the same species, but *hybrids*, intermediate between the parent plants, and with various degrees of resemblance to one or other of them, but not perfectly corresponding with either. Hence the production of hybrids, and multiplication of varieties of plants in gardens, by what is called the artificial impregnation of the stigma of one plant with the pollen of another, which, however, must be of an allied species, hybridisation being confined by the laws of nature within very narrow limits. See REPRODUCTION.

FEDERAL GOVERNMENT (Lat. *fœderatus*, bound by treaty, from *fœdus*, a treaty). When several states, otherwise independent, bind themselves together by a treaty, so as to present to the external world the aspect of a single state, without wholly renouncing their individual powers of internal self-government, they are said to form a Federation. The contracting parties are sovereign states acting through their representatives; and the extent to which the central overrules the local legislatures is fixed by the terms of the contract. In so far as the local sovereignty is renounced, and the central power becomes sovereign within the limits of the federated states, the federation approaches to the character of a Union; and the only renunciation of sovereignty which a federation as such necessarily implies, consists in abandoning the power which each separate state otherwise would possess of forming independent relations with foreign states. 'There are,' says Mr Mill, 'two different modes of organising a federal union. The federal authorities may represent the governments solely, and their acts may be obligatory only on the governments as such, or they may have the power of enacting laws and issuing orders which are binding directly on individual citizens. The former is the plan of the German so-called confederation, and of the Swiss constitution previous to 1847. It was tried in America for a few years immediately following the war of independence. The other principle is that of the existing constitution of the United States, and has been adopted within the last dozen years by the Swiss confederacy. The federal congress of the American Union is a substantive part of the government of every individual state. Within the limits of its attributions, it makes laws which are obeyed by every citizen individually, executes them through its own officers, and enforces them by its own tribunals. This is the only principle which has been found, or which is even likely to produce an effective federal government. A union between the governments only is a mere alliance, and subject to all the contingencies which render alliances precarious.'—*Representative Government*, pp. 301, 302. One of the chief difficulties which arise in organising a federal government, consists in discovering by what means disagreements between one or more of the local governments and the central government as to the limits of their respective powers, are to be disposed of. The arrangement by which this object was sought to be effected in America, of which M. de Tocqueville expressed his admiration, is thus explained by Mr Mill: 'Under the more perfect mode of federation, where every citizen of each particular state owes obedience to two governments—that of his own state, and that of the federation—it is evidently necessary not only that the constitutional limits of the authority of each should be precisely and clearly defined, but that the power to decide between them in any case of dispute should not reside in either of the governments, or in any functionary subject to it, but in an umpire independent of both. There must be a supreme court of justice, and a system of subordinate courts in every state of the union, before whom such questions shall be carried, and whose judgment on them, in the last stage of appeal, shall be final. Every state of the union, and the federal government itself, as well as every functionary of each, must be liable to be sued in those courts for exceeding their powers, or for non-performance of their federal duties, and must in general be obliged to employ those courts as the instrument for enforcing their federal rights. This involves the remarkable consequence, actually realised in the United States, that a court of justice, the highest federal tribunal, is supreme over the various governments, both state and federal, having the right to declare that any new law made, or act done by them, exceeds the powers assigned to them by the federal constitution, and, in consequence, has no legal validity.'—(P. 305.) 'The tribunals which act as umpires between the federal and state governments naturally also decide all disputes between two states, or between a citizen of one state and the government of another. The usual remedies between nations, war and diplomacy, being precluded by the federal union, it is necessary that a judicial remedy should supply their place. The supreme court of the federation dispenses international law, and is the first great example of what is now one of the most prominent wants of civilised society, a real international tribunal.' Such *was* the constitution of the greatest and most completely organised federation that the world has ever seen. To what extent it has been already shattered by recent events, it would be difficult to state, whilst it is absolutely impossible to conjecture in what form it may ultimately emerge from the greater dangers which still threaten it.

FEE AND LI'FERENT (in the Law of Scotland)—the first of which is the full right of proprietorship, the second the limited right of usufruct during life—may be held together, or may co-exist in different persons at the same time. The settling of the limits of the rights which in the latter case they respectively confer, is of very great practical importance, and, from the loose way in which both expressions have been used by conveyancers, by no means free from difficulty. 'In common language,' says Mr Bell, 'they are quite distinct; liferent importing a life-interest merely, fee a full right of property in reversion after a liferent. But the proper meaning of the word liferent has sometimes been confounded by a combination with the word fee, so as in some degree to lose its appropriate sense, and occasionally to import a fee. This seems to have begun chiefly in destinations "to husband and wife, in conjunct fee and liferent and children in fee;" where the true meaning is, that each spouse has a joint liferent while both live, but that each has a possible fee, as it is uncertain which is to survive. The same confusion of terms came to be extended to the case of a destination to parent and child—"to A. B. in liferent, and the heirs of the marriage in fee"—where the word liferent was held to confer a fee on the parent. It came gradually to be held as the technical meaning of the words "liferent to a parent, with fee to his children nascituri," that the word liferent meant a fee in the father. Finally, the expression came to be held as strictly limited to its proper meaning by the accompanying word "Allenerly" or some similar expression of restriction; or where the fee was given to children nati and nominatim; there being in that case no necessity to divert the word liferent from its proper meaning, or, on a similar principle, where the settlement was by means of a trust created to take up the fee.' (*Prin.* s. 1712.)

FEE, ESTATE IN, the largest estate in land in point of quantity of estate known to the law of England, being a Freehold (q. v.) of inheritance. Estates in fee are divided into fee-simple and fee-tail. A fee-simple is defined by Littleton (1, a.) to be a lawful and pure inheritance. In order to create an estate in fee-simple by deed, it is necessary that the word heirs should be used; for a gift by deed to a man for ever, or to a man and his assigns for ever, creates only an estate for life. But words of perpetuity annexed to a gift to a man by will are construed as carrying an estate in fee. The proprietor of an estate in fee-simple enjoys the fullest rights of property over his estate, which he may alienate or burden at pleasure, and out of which he may grant estates of a lower kind, as for life or years. He is owner of the soil '*a cœlo usque ad centrum*,' and is therefore entitled to every product of the land, as timber, &c., and to all minerals and other valuable productions found beneath the surface. On his death, the estate descends to his right heirs, except in the case of fees held by corporations, which descend to their successors in office. Where a man claims an estate in fee-simple in possession in a corporeal Hereditament (q. v.), he is said to be 'seised in his demesne as of fee.' Estates in fee-simple are divided into fee-simple absolute, qualified or base, and conditional. A qualified or base fee differs from a fee-simple absolute by having a qualification annexed which may determine the estate, as where it is granted to a man and his heirs 'tenants of the manor of Dale.' If, therefore, at any time the holder of the estate ceases to be the tenant of Dale, the estate, which depended on that qualification, determines.

A *conditional fee* was limited to a particular class of heirs, to the exclusion of others, as to a man and the heirs-male of his body. On failure of heirs-male of the body of the grantee, an estate of this kind reverted to the grantor or his heirs. But although the estate was thus limited, by the terms of the deed, to a particular series of heirs, the judges previous to the reign of Edward I. held that the gift was a fee-simple on condition of the birth of heirs of the body of the grantee, and that on the birth of an heir of the body, the condition on which the estate was held was purified. The estate did not indeed become *ipso facto* a fee-simple absolute, but the grantee was held entitled to sell the estate, to forfeit it for treason, and to burden it with encumbrances. But if the estate was not sold, and descended to the heir, he continued to hold a fee-simple conditional. This state of things led to the famous statute *De Donis Conditionalibus* (13 Ed. I. c. 1), whereby it was enacted that estates should be held *secundum formam doni*. Estates created by this statute were called estates in *fee-tail.* See Entail.

The original mode of transferring an estate in fee was by Feoffment (q. v.), but the statute of Frauds (29 Char. II. c. 3) requiring that writing should be used in all transfers of land, estates in fee must now be conveyed by deed or will.

The proprietor of an estate in fee-simple in the present day is, as has been said, absolute owner of the freehold, which he holds without owing duty or service to any one, except the allegiance due to the sovereign, who is regarded as supreme lord of all the lands in the kingdom. But originally this was not so; an estate in fee is in its nature a feudal benefice, a feud, and the owner of the fee held his estate subject to all the services incident to the feudal state. But these duties have been by degrees entirely abolished in England. See Feudal System, Tenures. In Scotland, the feudal usages in regard to land are still retained to a very great extent. The two distinct rights of superior and vassal continue to subsist. An estate in fee in Scotland must be held by one of the three existing tenures—viz., feu, blanch, or burgage, and is subject to the Casualties (q. v.) attaching to these rights. See Heritable Rights.

FEE-FUND, in Scotland, is the fund arising from the payment of dues of court on the tabling of summonses, the extracting of decrees, and the like. Out of this fund, the clerks and other inferior officers of the court are paid. If the fund is at any time insufficient for the purposes to which it is applied, the deficiency is supplied out of the moneys provided by the acts 7 and 10 Anne for keeping up the Scottish courts of law. The collector, since the passing of 1 and 2 Vict. c. 118, is appointed by the crown at a salary not exceeding £400 per annum.

FEEJEE. See Fiji.

FEELING. See Emotion.

FEES. Neither barristers nor physicians can recover their fees by legal proceedings against their clients or patients, except under a special contract. The ground of this rule is, that they are regarded not as payment, but as an expression of gratitude for services the value of which cannot be appreciated in money. The origin of the rule in the case of the advocates, is traced to the relation which subsisted between patrons and their clients in ancient Rome. When the former appeared as the defenders of the latter, they practised, as Blackstone says (iii. 29, Kerr's ed.), *gratis*, for honour merely, or at the most for the sake of gaining influence; and so likewise, it is established with us that a counsel can maintain no action for his fees, which are given, not as *locatio vel conductio*, but as *quiddam honorarium;* not as a salary or hire, but as a mere gratuity, which a counsellor cannot demand without doing wrong to his reputation. The rule at Rome was maintained even under the emperors, and Tacitus mentions (*Ann.* lib. ii. c. 5) that it was directed by a decree of the senate that these *honoraria* should not in any case exceed 10,000 sesterces, or about £80 of English money. It has further been decided in England, that no action lies to recover back a fee given to a barrister to argue a cause which he did not attend (Peake, 122). But special pleaders, equity draftsmen, and conveyancers, who have taken out certificates to practise under the bar, and therefore are not counsel, may recover their reasonable charges for business done by them (Poucher *v.* Norman, 3 B. and C., 744). Another rule with reference to the fees of barristers and advocates is, that they are paid before they are earned; a rule which, by removing from its members all pecuniary interest in the issue of suits, has done much to maintain the independence and respectability of the bar. As regards physicians, the rule that a fee cannot be recovered by an action at law, was applied in the case of Chorley *v.* Bolcot, June 30, 1791 (4 T. R. 317). But if either a barrister or a physician acts under a special agreement, 'as if a physician, who is my friend, hearing that my son is sick, goeth to him in my absence, and helps and recovers him, and I being informed thereof, promise him in consideration, &c., to give him £20, an action will lie for the money,' Veitch *v.* Russell (Q. B. R. 1842, p. 934); and the same was decided regarding a barrister, in Egan *v.* the Guardians of the Kensington Union, tried before Lord Denman, C. J., at the sittings in Middlesex, after Hilary term, 1841. Members of the inferior branches of both professions—attorneys, solicitors, &c., on the one hand, and surgeons, dentists, cuppers, and the like on the other—are all entitled to raise action for their fees. In Scotland, the same rules prevail as in England with reference to both professions. In France, though the delicate sense of honour of the bar has always been preserved with quite as much care as in England, the rule is somewhat different. In law, an action for the recovery of fees would be maintainable in that country by an advocate; but 'in Paris, the rule of the ancient bar, founded on the disinterestedness which was its characteristic, and according to which any judicial demand of payment of fees was strictly forbidden under pain of erasure from the table (of advocates), has been religiously preserved.'—*History of the French Bar*, by Robert Jones, 1855. The practice in France, however, seems to be for the fees of advocates to be paid afterwards, though any bargain with the client or his agent that their amount shall depend on the issue of a trial, is regarded as dishonourable; and on several occasions the bar has vehemently resisted regulations calling on them to acknowledge receipt of their fees, as wounding their sensibility. There can scarcely be a stronger proof of the value of what seem in themselves to be trifling and pedantic pieces of etiquette, than the dignified and independent position, which, from its scrupulous sense of honour, the French bar has maintained during all the political revolutions which the country has undergone.

FEHÉRVÁR (SZÉKES), the same as the Latin *Alba Regia*, or the German *Stuhlweissenburg*, is one of the most ancient royal free towns of Hungary, situated in a marshy district about 40 miles south-west of Pesth. Under the Arpâdian kings, it was the metropolis of the realm, and the residence of the sovereigns, who have been often crowned and buried there. On many occasions, the diets also were held in F., where twelve kings—among which are St Stephen, and the great Mathias Corvinus—lie buried. It is the seat of a bishop, and contains a population of 21,000, chiefly Roman Catholics, and all of the Magyar race. Water is supplied by an artesian well.

FËI'A, a large lake of Brazil, lies on the maritime border of the province of Rio Janeiro, and is distant 150 miles, to the north-east, from the city of the same name. It is so near to the Atlantic that it has been connected with it by means of a canal. F. is about a degree to the north of the southern tropic.

FEIGNING OF DISEASE is much practised in the army and navy, and also by convicts and others anxious to escape from discipline, or procure a discharge from compulsory service. In the army, it is technically called *malingering.* The detection of feigned disease, of course, necessarily belongs to the highly educated physician, and is impossible without a thorough knowledge of the reality, unless, indeed, the imitation be very coarse and badly studied. The diseases most commonly simulated are epilepsy, catalepsy, convulsions, blindness, deafness, palsy, insanity, indigestion, neuralgia, rheumatism, palpitation of the heart, and generally all disorders which may exist without leading to any distinct external appearances. Ulcers of the legs, however, have often been made, and kept open artificially through the application of irritant substances; and vomiting or coughing up of blood is very easily simulated, if the supposed patient can get access to the necessary materials in the slaughter-house or elsewhere. The detection of such impostures is easy or not according to the opportunities and knowledge and skill of the deceiver, as compared with those brought to bear on the discovery of the fraud. Many men in the public services, and women affected with hysteria, have become so expert as to deceive even men of high character and skill. The writer has known of an instance in which a man submitted to successive amputations of the arm upwards, nearly to the shoulder, for an ulcer produced and kept open at will by local applications; and a case has been lately recorded by Dr Murchison in the Medico-chirurgical Transactions, in which there is no reasonable doubt that a large opening into the stomach was the result of caustic substances deliberately applied to the abdomen, with the view of exciting sympathy.

FEINT (from the Fr. *feindre*), in military or naval matters, a mock attack or assault, usually made to throw an enemy off his guard against some real design upon his position. See FENCING.

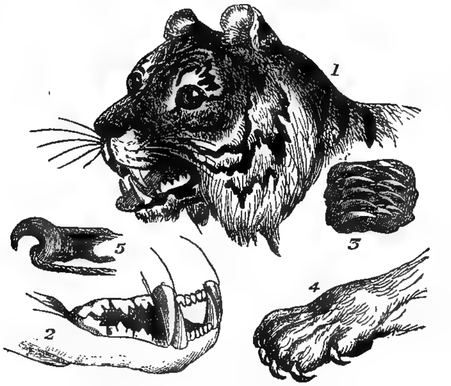
FEITH, RHIJNVIS, a distinguished Dutch poet, who ranks next to Bilderdijk (q. v.) as a reviver of the national poetry, was born 7th February 1753, at Zwoll in Overyssel, studied law at Leyden, and returned to his native town in 1776, where he held the office of burgomaster. He died 8th February 1824. F. tried almost all kinds of poetry. In his earlier productions, he shewed an excessive inclination for the sentimental; but in 1792 appeared his *Het Graf* (The Tomb), a didactic poem, which, though not free from the weakness referred to, is yet on the whole happily conceived, and contains some admirable passages. His *De Ouderdom* (Old Age), published in 1802, is deficient in plan. Among his lyrical pieces, *Oden en Gedichten* (Odes and Miscellaneous Poems, 4 vols., Amst. 1796—1810), are several marked by a high enthusiasm and warmth of feeling. Of his tragedies, the best known are *Thirza* (1791), *Johanna Gray* (1791), and *Ines de Castro* (1793). Along with Bilderdijk, he recast in a nobler form Haren's famous patriotic poem, *De Geuzen* (Les Gueux, or the Beggars), which celebrates the first struggles of the Dutch for independence. Of F.'s prose works, the most important are *Brieven over verscheiden Onderwerpen* (Letters on Different Subjects, 6 vols., Amst. 1784—1790). These Letters, by their polished style and refined criticism, did much to improve the literary taste of Holland.

FE'LDMANN, LEOPOLD, a German writer of comedies, was born at Munich in 1803, of Jewish parents, to whose faith he remains attached. Apprenticed in 1815 to a saddler, and afterwards to a cobbler, he soon gave evidence of his determination to be a poet by sending, in a pair of shoes, which he had mended, a poetical expression of his devotion to their fair wearer. For this his master sent him back to school, where in 1817, when only in his 14th year, he wrote a play, *Der Falsche Eid* (The False Oath), which was actually produced on the stage. After spending a few years in business at Pappenheim, and subsequently in Munich, he was induced, by the reputation which he gained from some humorous pieces, entitled *Genrebilder*, to devote himself entirely to literature. In 1835, his *Höllen-lieder* (Hell-Songs) appeared; and his first comedy, *Der Sohn auf Reisen* (The Son on his Travels), was acted in Munich with applause. While travelling thereafter for five years, chiefly in Greece, he wrote 'Pictures of Travel' for Lewald's *Europa*, and the correspondence for the *Allgemeine Zeitung*. In 1841, his comedy was produced in Vienna, and since 1850, he has been employed as histrionic teacher in the National Theatre of that capital. F.'s works, which are numerous, are reckoned among the best specimens of modern German comedy, pleasing by their cheerful humour, and happy employment of contemporary ideas and events, though complained of as deficient in artistic finish. F. has published a collection of his comedies in six volumes (*Deutsche Originallustspiele* (Original German Comedies), Wien, 1844—1852).

FELEGYHA'ZA, a town of Little Cumania, Hungary, is situated on the railway between Pesth and Temesvar, 67 miles south-east from the former. It has an extensive trade in grain, fruit, wine, tobacco, and cattle. In the neighbourhood, several Roman urns have been found. Pop. 17,900.

FELICU'DI. See LIPARI ISLANDS.

FE'LIDÆ, or **FELI'NÆ**, a family of digitigrade carnivorous quadrupeds (see CARNIVORA and DIGITIGRADA), corresponding to the genus *Felis* of Linnæus, and sometimes collectively called *cats* or the *cat tribe*. They are, generally speaking, the most carnivorous of all the *Carnivora*, holding the same relative place among quadrupeds that the *Falconidæ* do among birds. Their organisation is admirably suitable to their habits. They have a very lithe muscular frame; the body is rather long, and remarkably flexible; the limbs generally short. Few of the species possess much fleetness, but most of them excel in climbing and in leaping. When moving rapidly over the surface of the ground, they generally advance by a series of zigzag bounds, rather than by direct running. They are mostly inhabitants of forests, and many even of the larger species live much among the branches of trees, although some of the largest do not leave the ground. They all advance stealthily on their prey, which all of them kill for themselves, and devour in a perfectly fresh state, and generally whilst still warm and quivering. When they have approached within a sufficient distance, they complete the seizure by a spring, many of them uttering a roar or yell as they do so, and thus rendering their victory more secure by the consternation which paralyses the object of their attack. Their movements are extremely noiseless; owing to the soft velvety pads with which their toes are provided. Their claws are strong, much curved, very sharp, and retractile; being withdrawn by special muscles and ligaments into sheaths when not in use, and their points even turned upwards, so that they are not blunted by unnecessary friction, and do not interfere with the movements of the animal by accidentally hooking objects which are in the way. The last bone (*phalanx*) and joint of the toe exhibit peculiarities requisite for the extension and retraction of the claws. The fore-feet have five toes, the hind-feet four. The head of the F. is characterised by great breadth of skull, whilst the muzzle is short, and sometimes even rounded; the jaws are moved by very powerful muscles, and the articulation of the lower jaw is such that it has no rotatory motion; the teeth also being so shaped, and those of the two jaws so fitting to each other, that they cut like scissors—the lower teeth shutting within the upper—and are not at all adapted to the trituration of food. There are six small incisors in each jaw, followed on each side by one very large canine tooth, adapted for prehension; and this by two præmolars, or false molars, which, particularly in the lower jaw, are compressed and sharp-edged, their edges rising to a central summit, with inferior lateral cusps, so that flesh between them is subjected to a cutting action in various directions. Finally, there is on each side of each jaw one true molar, and in the upper jaw of many species, a second true molar. The crowns of all the teeth are covered with enamel. The tongue is rough, with horny papillæ directed backwards, by which it is fitted for cleaning the bones of the prey. The stomach is simple, the intestines short, and digestion rapid. The senses of sight and hearing are extremely acute; the eyes are adapted to seeing both by day and by night; the sense of smelling is also very acute, although apparently not equal to that of dogs; the sense of taste is supposed to be less acute; the bulbs from which the long whiskers arise appear to possess the sense of touch in great perfection, and the whiskers thus become useful in the progress of the animal through entangled thickets.



Characteristic Features of the Felidæ:
1, tiger's head; 2, shewing the dentition; 3, portion of tongue; 4, right fore paw, shewing claws; 5, claw, shewing tendons.

The F. agree so much in form and structure, that many naturalists still refuse to divide the Linnæan genus *Felis*. None of the F. are gregarious. Almost all of them, when taken young, seem capable of domestication, but in general they are little to be trusted. The species are numerous. They are distributed over Europe, Asia, Africa, America, and the islands adjacent to these continents; but none are found in Australia, where their place is supplied by the carnivorous marsupial quadrupeds. The largest species are chiefly found in warm climates. No species is known to be common to the Old and New worlds, although some are very nearly allied.

Vast numbers of the larger F. were brought from Africa and the East for those savage sports and shows in which the ancient Romans delighted. Five hundred lions were slain in five days at the opening of Pompey's theatre, and five hundred panthers have been let loose at once in a similar Roman arena. The wealth of Indian princes has also been often spent in fights of such beasts.

The principal F. are noticed in separate articles, as LION, TIGER, JAGUAR, PUMA, LEOPARD, PANTHER, CAT, TIGER-CAT, LYNX, CHEETAH, OUNCE, CARACAL, SERVAL, OCELOT, &c.

FE'LIX, ANTONIUS, a Roman procurator of Judæa (51—62 A.D.) in the time of the Apostle Paul, was a freedman of the Emperor Claudius I. The circumstances under which he received his appointment are related differently by Tacitus and Josephus. His government, politically considered, was in some respects good. According to Josephus and other authorities, he cleared the country of robbers, and vigorously suppressed the chaotic seditions of the Jews; but his cruelty, lust, and greed were unbounded. His wife was Drusilla, a beautiful but renegade Jewess, whom he had induced to abandon her first husband, and to form a questionable connection with himself. It was therefore not at all wonderful that F. should tremble as Paul reasoned of 'righteousness, temperance, and judgment to come' (Acts xxiv. 25). He was recalled to Rome, 62 A.D., on account of the accusations preferred against him by the influential Jews of Cæsarea, and narrowly escaped the sentence of death.

FE'LIX (POPE) I.—IV.—FELIX I., reckoned the 26th in the succession of popes, succeeded Dionysius in the see of Rome probably in the year 269. His pontificate is chiefly interesting as an early example of the relations of the Christian Church to the Roman empire, and of the recognition by the state of the civil rights of Christians. In the pontificate of Felix's predecessor, Dionysius, Paul of Samosata, Bishop of Antioch, had been deposed by a council held in that city. Paul having resisted the sentence, the matter was laid before Felix, Dionysius being now dead; and, as Paul held possession of the church and church buildings, the bishops were obliged to claim the interference of the Emperor Aurelian, who was passing through Antioch on his return from Palmyra. Aurelian returned a decision which is often appealed to in modern controversy, to the effect that the buildings should belong to the person 'to whom they should be adjudged by the bishops of Italy and Rome.' Felix afterwards suffered martyrdom in the persecution of the same emperor, Aurelian, probably in 274.—FELIX II. occupied the Roman see during the banishment of Liberius, in 355. It is agreed on all hands that his first appointment was intrusive, but much diversity of opinion exists as to his subsequent career. In reply to a petition for the recall of Liberius, it was proposed by the Emperor Constantius that Liberius and Felix should exercise jurisdiction jointly; but this proposition was rejected by the Romans, and Felix appears to have been compelled to retire from the city. According to the *Liber Pontificalis*, he suffered martyrdom in the end, at the hands of his former patron, Constantius; but this is not confirmed by any contemporary authority.—FELIX III. occupied the see of Rome from 483 till 492. He was a native of Rome, and of the family from which afterwards sprung Pope Gregory the Great. His pontificate is historically memorable, as presenting the first commencement of the disruption of the Greek and Roman churches. The contemporary occupant of the see of Constantinople, Acacius, as well as the imperial court, was a favourer of the Monophysite party, who refused to accept the decision of the council of Chalcedon. See MONOPHYSITES. By their influence, the patriarch of Alexandria was deposed, and replaced by the monophysite, Peter Mongus. The deposed patriarch having appealed to Rome, Felix sent two legates to Constantinople, to require his restoration; and the legates having failed in their trust, and Acacius still adhering to the heterodox party, Felix assembled a council at Rome, and excommunicated not only the offending legates, but also Acacius himself, the sentence being pinned by a monk upon the back of the patriarch's robes while he was actually officiating in the church. Felix had previously rejected the *Henoticon*, or Decree of Union, published by the Emperor Zeno. The schism thus inaugurated was not healed till the year 519. The only literary remains of this pontiff are the letters and other acts of this controversy. He died February 24, 492.—Felix IV., a native of Benevento, succeeded John I. in 526. His pontificate presents no noteworthy event. He died in 530.—Felix V. (anti-pope). See Amadeus.

FELI'XIANS, a Spanish sect of the latter part of the 8th c., so called from Felix, Bishop of Urgel. See Adoptian Controversy.

FE'LLAH (plural, El Fellahin), an Arabic word meaning peasant or agriculturist, specially applied to the agricultural or labouring population of Egypt by the Turks, in a contemptuous sense, as 'clowns,' or 'boors.' They form the great bulk of the population, and are descendants of the ancient Egyptians, intermingled with Syrians, Arabs, and other races who have been converted to Islam. In their physical conformation and features, they differ among themselves, those of the northern provinces of the Mediterranean being of whiter hue, while at Assouan they are almost black. They are described as having a large skull, facial angle almost 90 degrees, oval face, arched eyebrows, deep eyes, projecting lips, large mouth, thin beard, short nose, large chest, and small belly; arched back, and small hands and feet, and being of mean height. They form the fourth class of the population, and are distinguished from the Bedouin or free Arabs, who have entered the country later than the Saracenic conquest, and the Arabs of the towns and villages. Their dress consists of a shirt and linen drawers, over which is a larger blue shirt (*herie*), girdled by a leather or stuff belt, which is exchanged in the winter for a coat with sleeves (*zabout*). On their head, they wear the *tarboush*, turban, or a black or gray cap; the women tattoo themselves, and are nubile at an early age, being often married at 11 years, mothers at 12, and grandmothers at 24. The food of the Fellahin consists entirely of vegetables, which they eat in a crude state, dhourra bread, and beans. Even rice is too dear for them and animal food unattainable. Their drink is limited to the waters of the Nile and coffee, and the only luxury which they enjoy is the green tobacco of the country; yet on this diet they are robust and healthy, and capable of much labour and fatigue. In their social position, they are inferior to the Bedouin, who, although they will marry the daughters of the Fellahin, will not give to them their own in marriage. They appear to exhibit the moral qualities of the ancient Egyptians, being intelligent, grave, and calm, docile, pliable, and sober on the one hand; and idle, jealous, quarrelsome, satirical, licentious, and of unbending obstinacy, on the other, and inherit the traditional hatred of their ancestors to the payment of taxes, which are often only extorted by the bastinado. Their political condition is most miserable. Each village is governed by a Sheik-el-Beled, who is responsible to the Nazirs and Mamours, or district officers, for the conduct of the inhabitants, and their due payment of taxes. So oppressive, indeed, is the taxation and extortion, scarcely $\frac{1}{20}$ of the produce falling to their lot, that it would not be possible for them to live if it were carried to a higher pitch, and none cultivate the lands with diligence unless compelled by their superiors.—Gliddon, *Types of Mankind*, p. 319; Lepsius, *Egypt and Ethiopia*, p. 76; Lane, *Manners and Customs of Modern Egyptians*, pp. 125, 126, 192, 193; Clot Bey, *Aperçu générale*, i. pp. 159, 160.

FE'LLENBERG, Philip Emanuel von, the founder of the institution for the improvement of education and agriculture at Hofwyl in the canton of Bern, in Switzerland, was born at Bern in 1771. His father was a man of patrician rank, and in consequence, a member of the government. From him F. received a very careful education; but it was his mother, a great-grand-daughter of the famous Dutch admiral, Van Tromp, who inspired him with the ardent desire of being useful to his fellow-creatures. In 1789, he went to the university at Tübingen, for the purpose of studying law, and subsequently travelled in various parts of Europe, taking up his quarters not in the hotels of the large towns, but in the cottages of the peasantry, that he might know at first hand the real condition and the manners of the poor, as well as the kind of education received by those whose life was to be spent in agricultural pursuits. When the revolution of 1798 broke out in Switzerland, F. took part in it for some time; but the faithlessness and want of public spirit on the part of the Bernese government induced him to withdraw from political life altogether, and to devote himself solely to philanthropic schemes. He now purchased the estate of Hofwyl, near Bern, and soon after entered into an alliance with Pestalozzi, the educationist. Their different characters, however, rendered such a union impracticable, and they found it necessary to separate. F. now proceeded with redoubled zeal to increase the produce of his estate by new improvements, to influence the neighbourhood by his example, and to make his experiments known to the world by his agricultural treatises. At the same time, he founded an asylum for forsaken children. He also opened a school of theoretical and practical agriculture, and connected with it an institution for the education of the children of the higher classes. The establishment at Hofwyl acquired for its founder a very great reputation, and pupils hastened to it from all quarters. Many foreign princes visited it, and on their return to their own countries, founded similar institutions. In the year 1830, F. founded a school of art, and some years later, an infant school. He died 21st November 1844. The institutions at Hofwyl were continued for some years by his son Wilhelm, and then entirely given up. Compare Hamm, *F.'s Leben und Wirken* (Bern, 1845).

FE'LLOWS, Sir Charles, an antiquary of considerable reputation, was born at Nottingham in 1799. In the beginning of 1838, he commenced those travels in the East by means of which his name has been brought so prominently into public notice. His researches were chiefly confined to the western peninsula of Asia Minor, and to the course of the ancient Xanthus, in the south of that peninsula. Commencing his investigations at Patara, at the mouth of the Xanthus, and proceeding inland along the valley of that river, he discovered, only nine miles from the coast, the ruins of the city of Xanthus, formerly the capital of Lycia. Fourteen or fifteen miles higher up the river, he met with the ruins of another city, which, from inscriptions, he found to be the ancient Tlos. Having made drawings of some of the fine remains of architecture and sculpture which he found in the ruins of these cities, and copies of some of the inscriptions, F. returned to England, and published *A Journal written during an Excursion in Asia Minor, by Charles Fellows*, 1838 (Lond. 1839). In 1839, he again visited Lycia, and in the course of another excursion, he discovered the ruins of no less than thirteen cities, each of which contained works of art. Another Journal, entitled *An Account of Discoveries in Lycia, being a Journal kept during a Second Excursion in Asia Minor* (Lond. 1841), was the result of this journey. In 1841, an expedition left England for the purpose of selecting works of art from the ancient cities discovered by F., who accompanied the expedition, and directed its operations. Authorised by a firman from the sultan, they made their selections, and returned in the spring of 1842. Another expedition sent out by the trustees of the British Museum brought home twenty cases of marbles and casts in 1844. These remains have been deposited in the British Museum in what has been called the Lycian Saloon. In 1845, F.'s labours were rewarded by the honour of knighthood. The other works of F. are—*The Xanthian Marbles: their Acquisition and Transmission to England* (1843); *An Account of the Ionic Trophy Monument Excavated at Xanthus* (1848); a re-issue of his earlier Journals under the title of *Travels and Researches in Asia Minor, particularly in the Province of Lycia* (1852); and *Coins of Ancient Lycia before the Reign of Alexander; with an Essay on the Relative Dates of the Lycian Monuments in the British Museum* (1855).

FE'LLOWSHIP, IN A UNIVERSITY. As the history of this institution will be treated under UNIVERSITY, we shall here only mention its leading characteristics, as it exists in the two great universities of England—Oxford and Cambridge. In these ancient and celebrated seats of learning, the fellowships were either constituted by the original founders of the colleges to which they belong, or they have been since endowed. In almost all cases, their holders must have taken at least the first degree of Bachelor of Arts, or student in the civil law. One of the greatest changes introduced by the commissioners under the University Act of 1854, was the throwing open of the fellowships to all members of the university of requisite standing, by removing the old restrictions by which many of them were confined to founder's kin, or to the inhabitants of certain dioceses, archdeaconries, or other districts. Fellowships vary greatly in value. Some of the best at Oxford, in good years, are said to reach £700, or even £800, whilst there are others which do not amount to £100, and many at Cambridge which fall short of that sum. Being paid out of the college revenues which arise from land, they also vary from year to year, though from this arrangement, on the other hand, their general value with reference to the value of commodities is preserved nearly unchangeable, which would not be the case if they consisted of a fixed payment in money. The senior fellowships are the most lucrative, a system of promotion being established among their holders; but they all confer on their holders the privilege of occupying apartments in the college, and generally, in addition, certain perquisites as to meals or commons. Many fellowships are tenable for life, but in general they are forfeited should the holder attain to certain preferments in the church or at the bar, and sometimes in the case of his succeeding to property above a certain amount. In general, also, they are forfeited by marriage, though this disability may now be removed by a special vote of the college, permitting the fellow to retain his fellowship notwithstanding his marriage. With the single exception of Downing College, Cambridge, in which the graduates of both universities are eligible, the fellowships are confined to the graduates of the university to which they belong.

FELLOWSHIP. See PARTNERSHIP.

FE'LO DE SE, in English Law, is where a man, of the age of discretion, and *compos mentis*, voluntarily kills himself. 'No man,' says Sir M. Hale (*Pl. of the Cr.* 411), 'hath the absolute interest of himself, but 1*st*, God Almighty has an interest and propriety in him, and therefore self-murder is a sin against God; 2*d*, The king hath an interest in him, and therefore the injunction in case of self-murder is *felonicè et voluntariè se interfecit et murderavit contra pacem domini regis*.' A man or woman is considered of full age in regard to capital offences at the age of fourteen. A lunatic killing himself during a fit is not guilty of felo de se; but a merely melancholy and hypochondriacal temperament is not such a state of mind as will relieve a person from the consequences of this offence. Where two persons agree to die together, and in pursuance of this design one or both die, it is suicide, or felo de se. And in some cases, where one maliciously attempts to kill another, and unwittingly kills himself, this is said (Hawkins, P. C. c. 27, s. 4) to be felo de se. But as a general rule the act must be voluntary. Therefore, if death ensue from a rash act not intended to kill, as where a man cuts off his hand to prevent a gangrene, and the act is followed by death, this is not felo de se. Formerly, the law punished this offence by inflicting ignominy on the body of the offender, which was ordered to be buried by night at four cross-ways, and that a stake should be driven through the body. But by 4 Geo. IV. c. 52, this ignominious mode of burial is abolished, and it is provided that a felo de se shall be privately buried at night in a burial-ground. All the chattels, real and personal, of a felo de se are forfeited to the crown. In Scotland, the crime of self-murder is known as Suicide (q. v.).

FE'LON AND **FE'LONY.** The etymology of the word felon has given rise to much difference of opinion. By the majority of the most reliable lexicographers, it is supposed to have a common root with *fail*, and its original signification was supposed to be a vassal who failed in his fidelity or allegiance to his superior, thus committing an offence by which he forfeited his fee or feud. From this it came to signify traitorous or rebellious, and was gradually generalised till it reached its popular meaning of a crime of so heinous a nature as to infer a capital punishment.

The characteristic distinction of a felony, in the opinion of all legal writers, is, that it is a crime which occasions the forfeiture of the offender's goods. 'Felony,' says Blackstone, 'in the general acceptation of our English law, comprises every species of crime which occasioned at common law the forfeiture of lands and goods. Treason itself, says Sir Edward Coke, was anciently comprised under the name of felony. . . . . And to this also we may add, that not only all offences now capital are in some degree or other felony, but that this is likewise the case with many other offences which are not punishable with death—as suicide, where the party is already dead, manslaughter, and larceny, all which are felonies, as they subject the committers of them to forfeitures. So that, upon the whole, the only adequate definition of felony seems to be, that which is before laid down—viz., an offence which occasions a total forfeiture of either lands or goods (or both) at the common law, and to which capital or other punishment may be superadded, according to the degree of guilt.'—Stephen's *Com.* vol. iv. p. 81. From this statement it appears that the popular notion that capital punishment is inseparable from the idea of felony, is, as Blackstone elsewhere remarks (Stephen, *ut sup.* p. 83), an error. As to the present law of forfeiture in cases of felony, see FORFEITURE.

FE'LSPAR (Ger. *feldspath*, field-spar), a mineral extremely abundant in almost all parts of the world. It is a principal constituent of many rocks, as granite, gneiss, greenstone, trachyte, &c.; and clays seem very generally to have resulted, at least in great part, from its decomposition. It occurs both massive and crystallised, in rhomboidal, pyramidal, and prismatic crystals, often having their edges and angles truncated, and thus very variously modified. There are many different kinds of F., which mineralogists have recently attempted to arrange in mineral species, distinguished by physical and chemical characters, and also by geognostic position, and by the groups of minerals with which they are associated. For these mineral species new names have been invented, *Orthoclase*, *Oligoclase*, *Albite*, *Labradorite*, &c. All the felspars are anhydrous silicates of alumina, and of an alkali or lime. Orthoclase, and the other more silicious felspars containing potash, abound chiefly in granite and the *plutonic* rocks; the less silicious, containing soda and lime, characterise the *volcanic* rocks—'as labradorite the basaltic group, glassy felspar the trachytic.' All the kinds of F. are so hard as not to be easily scratched with a knife, and are fused with difficulty. Some of them are soluble, some insoluble in acids.—The kind known as COMMON F.—referred to *Orthoclase*—is generally white or flesh-coloured, has a glassy and somewhat pearly lustre, is translucent at least on the edges, and has an uneven or splintery fracture. Crystals four or five inches long are found in Aberdeenshire. This variety, under the name of *Petunse* or *Petuntze*, is used by the Chinese in the manufacture of porcelain; along with some of the quartz which is associated with it in the rock. It is used, with other materials, as a flux; and alone to form an enamel or glassy covering, without which the porcelain would absorb moisture and grease, and would be unfit for any except mere ornamental purposes.—ADULARIA is a transparent and almost colourless variety of F., often cut as an ornamental stone, the finest varieties, of which one is known as MOONSTONE, being prized almost as gems. A variety, found among rolled stones in Ceylon, and remarkable for the reflection of a pearly light, has been sometimes confounded with *Cat's Eye*.—AVANTURINE F. is similar to the variety of quartz called *Avanturine* (q. v.) in the play of light which it exhibits, and which is said to be owing to minute crystals of specular or titanic iron. It is much esteemed as an ornamental stone. A variety with golden yellow specks, called SUNSTONE, is very rare and very beautiful: it sells at a high price.—LABRADORITE exhibits rich colours and a beautiful opalescence, on account of which it is much used for ornamental purposes.—A blue variety of F., found only in Styria, and a green variety, sometimes called *Amazon Stone*, are also esteemed as precious stones.—All the finer varieties of F. are characterised by a soft beauty, which well compensates for the want of that brilliancy which belongs to the true gems.

Kaolin, or *Porcelain Clay*, is regarded as a decomposed felspar.—To F. also are referred, as chiefly composed of it, or apparently derived from it, Felstone, Trachyte, Claystone, Clinkstone, Pitchstone, Obsidian, and Pumice.

FE'LSTONE, a name introduced by Professor Sedgwick to designate those rocks which are composed, either in whole or to a large extent, of felspar. When they consist of a compact and apparently amorphous felspar, they are known as Trachytes—a variety of this rock, which splits into small slabs, that ring with a metallic sound, is called Phonolite. Trachyte, with distinct crystals of felspar scattered through it, becomes felstone porphyry; when the rock is in a vitreous condition, and has a resinous lustre, it is Pitchstone. Even in the most compact felstones, minute crystals may be detected, and these sometimes increase in size, till we have varieties which are completely granular and crystalline.

FELT, FELTING, a fabric formed without weaving, by taking advantage of the natural tendency of the fibres of hair and wool to interlace with and cling to each other. The hatters' tradition concerning the invention of felt affords as good an illustration as any we can find of the principle of this manufacture. In most Roman Catholic countries, the hatters celebrate as a festival the 23d of November, St Clement's Day, as they formerly did in this country; and it is stated that St Clement, when on a pilgrimage, put carded wool between his feet and the soles of his sandals, and found on his journey's end that the wool was converted into cloth. Although this tradition is very questionable, as the manufacture of felt is of far more ancient origin, there can be no doubt that if carded wool were thus continually trodden, and at the same time moistened, it would become felt, and all the manufacturer's processes of felting are but modifications of such treatment.

This matting or felting of the fibres of hair and wool results from their structure, for, when examined by the microscope, the hair of all animals is found to be more or less jagged or notched on its surface; in some animals it is distinctly barbed; and this structure is so directed that the teeth or barbs all point towards the tip of the hair. See HAIR. If a piece of human hair (in which this structure is less marked than in most animals) be held between the finger and thumb, and rubbed in the direction of its length, it will invariably move between the fingers in the direction of its root; for the skin, while moving towards the tip of the hair, slides freely upon it, but moving in the other direction, against the inclination of the barbs, it brings the hair with it. It will be easily understood that when a number of hairs are pressed together, those which lie in opposite directions to each other and in contact will interlock at these barbs or teeth, and thus resist any effort to tear them asunder. When once this close contact and interlocking is established between any two or more hairs, they remain attached, but the others that are differently arranged, or not in contact, will still be free to move upon each other; and therefore, if subjected to continual blows, pushing, and pressure, like the treading of the feet in walking, the unattached hairs will be continually shifting until they reach others in suitable positions for clinging together, either by crossing obliquely or by lying in the same line, and overlapping at their ends or any other portion. When the hair has a natural tendency to curl, the felting is still more readily brought about by the additional interlacing. This is the case with wool to such an extent, that when free from grease it cannot be retained in the straight carded condition required for spinning and weaving. When it is required to be felted, the natural grease has to be removed. This tendency to felt is shewn in the hard lumps formed in wool-mattresses that have been long used.

The beaver-hat maker produces his felt by taking a few ounces of the mixed fur, distributing it in an even layer by twanging a bowstring against the heap, and then condensing this into a felt by a sort of kneading process with his hands. See HAT-MAKING.

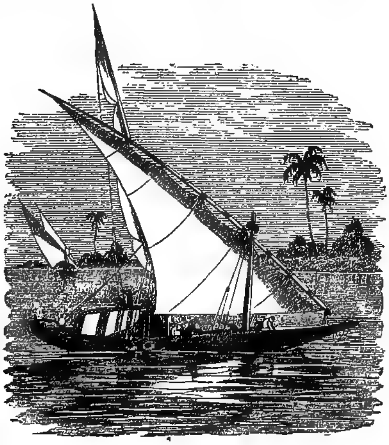
The felt now extensively used for carpeting and other purposes is made by machinery, chiefly from the waste wool from the weaving-mills. Many patents have been taken out for the various details of felting-machinery, but the main principle is the same in all. The wool is carded more or less perfectly, and steamed or moistened with hot water, and passed between beaters, which act like the pilgrim's feet in the manner already described. When used as drugget for covering carpets, or as a substitute for carpet, the felt is printed by means of blocks with various patterns, or simply dyed. Felt is also used for padding coats and other garments, sometimes for cloaks and capes; for table-covers, some of which are beautifully embossed and printed; for carriage-linings, upholstery work, polishing cloths, pianoforte hammers, and various other purposes where a coarse or thick cloth is required. A simple kind of saddle, cut out of very thick felt, is in common use in South America.

The 'felted sheathing' used as a non-conducting covering for retaining the heat in steam-boilers, is a substance intermediate between felt and paper, being composed of the commonest woollen refuse from paper-mills, &c., made into a semi-pulp, and beaten to produce a partial felting. This when dried hardens, and though possessing but little tenacity, and unfit for the wear of friction, is, from its compactness, better adapted than ordinary felt for the purposes to which it is applied.

Asphalted Roofing-felt is a very coarse felt saturated with pitch, asphalt or coal-tar—usually the latter, on account of its cheapness; it is retailed at one penny per foot, and used for covering sheds and other buildings. A more expensive kind, free from coal-tar, is called *Inodorous Felt*, and used as a lining for damp walls upon which paper has to be hung. Asphalted felt is also used as a flooring for granaries and similar buildings, and has been recommended for public schools, to prevent the noise from the shuffling of the children's feet.

FE'LTRE', a town of Northern Italy, in the Venetian territory, is situated near the right bank of the Piave, 44 miles north-north-west of Venice. It suffered severely from the attacks of the Goths in the 5th century. The chief buildings are the cathedral, the college, ecclesiastical seminary, and gymnasium. F. has some trade in corn, wine, and oil. Pop. 6000.

FELU'CCA, a small class of vessel used in the Mediterranean. It is propelled by from 10 to 16 oars, and by lateen sails. It has frequently a rudder at each end, to be applied as occasion demands. During the French war, feluccas were armed with a heavy gun or two, and sent out as gun-boats against our ships, when becalmed near the Spanish ports; from their speed in smooth water, and the difficulty of hitting them, they were very troublesome antagonists.



Felucca.

FEMALE LABOUR is prohibited in mines and collieries since 1st March 1843 (5 and 6 Vict. c. 99), under heavy penalties. As to the limits under which it is permitted in factories, see FACTORY LAWS.

FEMALE SHERIFF. There is only one instance on record of the office of sheriff in England having been held by a female; this was in the case of Anne, Countess of Pembroke. This lady, who was distinguished during the rebellion in the reigns of Charles I. and II. by her stanch adherence to the royal cause, was the wife of Philip, fourth Earl of Pembroke, and daughter of the Earl of Cumberland. On the death of her father, without male issue, in 1643, she succeeded to the hereditary office of sheriff of Westmoreland, and in that character she attended the judges of assize, and sat with them on the bench at Appleby.

FEMALE WHIPPING, as a public punishment, was abolished by 57 Geo. III. c. 75; and by 1 Geo. IV. c. 67, it was enacted that no female offender should suffer the punishment of being whipped either publicly or privately; but that imprisonment or solitary confinement should be substituted therefor. See WHIPPING.

FEME COVERTE (*fœmina viro co-operta*). In the language of the law of England, a woman by her marriage becomes subject to her husband, who has the control of her person, and is entitled to fix her residence. This control in the husband is admitted to a certain extent in criminal cases to excuse a married woman from guilt. Thus, in any felony, except murder or manslaughter, committed by a married woman, in presence of her husband, it is assumed that she acted under his compulsion. But this presumption may be rebutted by evidence that she was the principal agent in the crime. A married woman cannot, in criminal cases, be a witness for or against her husband, except when he is tried for violence against her. In civil cases, a married woman may be examined in a suit where her husband is a party. In a petition for divorce on the ground of adultery, a married woman is not a competent witness; but where cruelty forms one of the grounds of complaint, she may be examined on that subject. The property of the wife is by marriage transferred to the husband. Personal property, even though acquired by her own exertions, is absolutely vested in the husband, and cannot even be disposed of by will by a married woman. By 7 Will. IV. and 1 Vict. c. 26, even a will made before marriage is revoked by the marriage. But where a wife is deserted by her husband, she may, by 20 and 21 Vict. c. 85, s. 21, obtain an order to protect any money she may acquire by her own industry. The landed property of a married woman is, during the marriage, under the administration of the husband, and during their joint lives, he is entitled to all the profits of the lands. Should there be a child of the marriage born alive, and capable of inheriting the lands, he has, by the Courtesy of England (see COURTESY IN LAW), an estate for life in all lands in which he is seised in fee in her right. Formerly, a married woman could not, during marriage, execute a conveyance of lands without levying a Fine (q. v.); but by 3 and 4 Will. IV. c. 74, a married woman may now make a disposition of real estate as if she were a *feme sole*. But the husband must concur in the deed, which must also be acknowledged by the wife, in presence of one of the judges, a master in Chancery, or of a commissioner appointed under the act. An action cannot be maintained either by or against a married woman during the subsistence of the marriage, unless with the concurrence and in name of the husband. A married woman cannot bind her husband by any contract she may enter into, but as he is bound to support her, he is liable for necessaries supplied to her while she lives with him, or if he wilfully deserts her, but not where she has left him of her own accord. Formerly, a wife could not obtain a divorce from her husband; but by 20 and 21 Vict. c. 85, she may now obtain a divorce on the ground of adultery, coupled with cruelty or desertion. See DIVORCE. For the law of Scotland in regard to the rights of married women, see MAN AND WIFE.

FE'MERN, an island of Denmark, north-east of Holstein, and separated from it by a strait called the Femern Sound, has an area of 63 square miles, and a population of about 9000. The island is flat, fruitful, and destitute of wood. Agriculture, fisheries, and stocking-weaving for exportation, form the principal employments of the inhabitants. The chief town is Burg, which has about 2000 inhabitants.

FE'MGERICHTÉ (derived from the old German *Fem*, punishment, and *Gericht*, court of justice), spoken of as the Holy Feme (or Fehme), and also known as the Westphalian or Secret Tribunals, were among the most remarkable phenomena of the middle ages, and supplied the place of the regular administration of justice, then in a deplorable condition. The origin of these courts has been ascribed to Charlemagne, who, it was pretended, had instituted them to prevent the relapse into Paganism of the Saxons who had been forcibly converted to Christianity. It is more probable, however, that they were a relic of the ancient German free courts of justice, the preservation of which may have been favoured in Westphalia by special circumstances.

When Henry the Lion was put under the ban of the empire, and deprived of his possessions in 1179, Westphalia, which then comprised nearly the whole district between the Rhine and the Weser, was granted to the Archbishop of Cologne; and from this time the secret tribunals gained in importance. In the general confusion which then prevailed in Germany, when all laws, both civil and ecclesiastical, had lost their authority, and the fabric of society seemed on the point of toppling into ruins, the Femgerichte were organised for the purpose of arresting and controlling the incipient anarchy that threatened to bring chaos back again, and of inspiring with feelings of salutary terror, through the agency of their mysterious powers and solemn judgments, all rapacious and lawless persons (but especially the feudal barons), who—on account of the impotence of the ordinary legal checks—committed crimes with impunity. In the causes, therefore, which led to their formation, and in their general design, the Femgerichte resemble the Hanseatic towns. They soon acquired tremendous influence, the emperors themselves having recourse to their assistance against powerful and rebellious nobles. It was in the 14th and 15th centuries, however, that they attained the summit of their dread authority, when they began to extend themselves over the whole of Germany. Beneficial as in many instances they proved to be, they could not fail, in the long-run, to degenerate, and to be frequently employed as a cloak to self-interest and malice. It is therefore by no means surprising that many voices were raised against them, and that in 1461 various princes and cities of Germany, as well as the Swiss confederates, formed unions for affording justice to every individual, and preventing any from seeking it from the secret tribunals. Particular classes likewise obtained imperial letters of protection against the pretensions of these tribunals. The emperors themselves, however, could go no further than to make some unavailing attempts to introduce improvements into the constitution of the Femgerichte, as the latter were bold enough to oppose the imperial authority, and even summoned the emperor Friedrich III. to appear before them. Their influence came to an end only when the public peace (*Landfriede*) was established in Germany, and an amended form of trial and penal judicature was introduced. The last real Femgericht was held at Celle, in Hanover, in the year 1568. A remnant of the institution, however, existed in Westphalia until the year 1811, at which time it was performing the function of a society for the suppression of vice, when it was abolished by an order of Jerome Bonaparte. Beyond the limits of Westphalia, notwithstanding all their endeavours, the Femgerichte never succeeded in fully establishing their authority; and even in the *Red Land*, as Westphalia was called (probably from the colour of the soil), they were restricted by the imperial privileges on which they founded their authority.

The members of the Feme were called *Wissende*, 'the knowing ones,' or the *initiated*. It was necessary that they should be born in wedlock, be of the Christian religion, lead a blameless life, and bind themselves by a tremendous oath 'to support the holy Feme, and to conceal it from wife and child, father and mother, sister and brother, fire and wind, from all that the sun shines on and the rain wets, and from all that is between heaven and earth.' Originally, none but an inhabitant of the 'Red Land,' possessed of real property, could be admitted a member of the Wissende; at a later period, this rule was relaxed. From the general body were elected officers called *Freischöffen* (free justices), who were assessors of the court, and executors of its sentences. The presiding judge was called the *Freigraf* (free count). The general superintendence and presidency of the secret tribunals belonged to the lord of the land—i. e., in Westphalia, to the Archbishop of Cologne. The highest office, however, as supreme president, was nominally held by the emperor, who was usually elected into the number of the Wissende on the occasion of his coronation at Aix-la-Chapelle. The court of a Freigraf was called *Freiding* (a free court of justice), and the place where he held court a *Freistuhl* (free bench or court). One of the most celebrated free courts had its seat at Dortmund. The sittings of the tribunal were either open or secret. The former were held by day in the open air, and decided in civil disputes: the secret tribunals took cognizance of those who had been unable to prove their innocence in the open courts, as well as of those who were accused of heresy, sorcery, rape, theft, robbery, or murder. The accusation was made by one of the Freischöffen, who declared, upon oath, that the accused had committed the crime. The citation was secretly affixed, with symbolical signs, to the door of the accused, who was to meet the Wissende at a certain hour and place, and be conducted by them before the tribunal. The accused could now clear himself by an oath, but the accuser and witnesses could oppose this with another. If the accused could now bring forward six witnesses to swear in his favour, the accuser could strengthen his oath with 14 witnesses; and it was not till after 21 witnesses had made their affidavit in his favour that sentence of acquittal necessarily followed. The persons convicted, as well as those who refused to obey the summons, were given over to the Freischöffen. The first Freischöffe who met him was bound to hang him on a tree, or, if he made any resistance, to put him otherwise to death. A knife was left by the corpse, to shew that it was not a murder, but a punishment inflicted by one of the Freischöffen. Compare Wigand, *Das Fehmgericht Westfalen's* (Hamm. 1825), and Usener, *Die Frei- und heimlichen Gerichte Westfalen's.* (Frankfort, 1832).

FENCES, in Agriculture, serve the twofold purpose of enclosing animals on pasture-grounds, and of protecting land from straying animals. They are formed of a great variety of materials, and of very different structure. In countries where wood or stones are scarce, more especially where they have been long settled, hedges, formed of various kinds of plants, are common. These, when well kept and managed, give a clothed and picturesque appearance to the landscape. The hawthorn is the favourite hedge-plant in this country. See HEDGES.

When stones are used as fences, they are built as walls. The form and mode of building varies with the nature and quality of the stones, and the degree of taste and nicety required. Aberdeenshire forms its walls or dykes surrounding its fields with the granite boulders that are strewed over the surface of the country. The graywacke affords slaty stones, which give the walls their peculiar form in other parts, and so with the various kinds of sandstone.

In new countries, where wood is abundant, the fences are all of this material. The snake-fence, named from its zigzag form, is made by merely laying the ends of trees above each other, and requires no other means of fixing. As wood becomes more valuable, it is made into stobs and rails. The stobs are driven into the ground from two to three yards apart, and from four to five rails are nailed across, according to the purpose it is meant to serve. The stob and rafter fence is made by driving the stobs from three to four inches apart, and binding the whole by a rafter or rail nailed across the top. This is one of the strongest of wooden fences, but requires more material than the other.

Iron or wire fencing has come much into use of late. Vast stretches of waste land in this country, as well as pastures in Australia, have been enclosed by means of wire-fencing. Strong wires are stretched on posts firmly secured in the ground, from 100 to 200 yards or more apart. Intermediate or lighter posts are put in at from two to three yards' distance. After the wires are fully stretched, they are fixed to the smaller posts; when of wood, by means of staples, or threaded through, when of iron.

Law regarding Fences.—In England, it is held to be the duty of the occupier of lands to repair and uphold fences, and not of the landlord; and without any special agreement, the landlord may maintain an action against the tenant for not doing so. Though a tenant from year to year is not bound to put the fences and other buildings on his farm into repair, he must not do anything that amounts to waste, or to a breach of the rules of good husbandry. He cannot cut and sell hedgerows, or if he does so, he must make up the hedges and fences according to the course of good husbandry. 'If there be a quickset fence of white thorn, and the tenant shut it up, or suffer it to be destroyed, this is destruction; but cutting up quicksets is not waste, if it preserves the spring.'—Woodfall *On Landlord and Tenant*, pp. 456, 457, and cases cited. Where, in answer to a declaration against a tenant for not using premises in a husbandlike manner in repairing fences, on his implied obligation to do so, the tenant pleaded that the fence became out of repair by natural decay, and that there was no proper wood which he had a right to cut for repairing the fences, and that the plaintiff ought to have set out proper wood for the purpose of repairs, which he had neglected to do, the plea was held to be bad, because it did not aver any request to the plaintiff so to do, or a custom of the country in that respect.—Whitfield *v.* Weedon, 2 Chit. 685. By 7 and 8 Geo. IV. c. 29, ss. 23, 40, 44, the destruction of fences is declared to be punishable summarily with a fine of not more than £5; or in the case of a deer-park fence, with £50. The statute is limited to England.

In Scotland, the landlord is held bound to put the fences on the farm in due repair on the entry of the tenant, independently of any stipulation in the lease; whilst the tenant must maintain them and leave them, with the exception of ordinary tear and wear, in the state in which they were given over to him. But the landlord is not entitled to increase the burdens of his tenant by erecting new fences not stipulated for, unless they be march-fences, which he may be compelled to erect by contiguous proprietors, and half the expense of which he must share with them, under the act 1661 c. 41, ratified by 1685 c. 39, of the existence of which the tenant is presumed to have been aware when he entered to the farm. As regards fences erected spontaneously by the tenant, the rule is that if, being entitled to remove them, he allows them to remain, he must leave them in repair; but if they are Fixtures (q. v.), which he is not entitled to remove, he is not bound to repair them. It is optional to the landlord, at the termination of the lease, to order removal of fences and other buildings voluntarily built by the tenant, except in the case of palings and movable fences, or to prevent their being removed without offering any indemnification.—Hunter, *Landlord and Tenant*, ii. p. 208. As buildings, fences, and other ameliorations made by the tenant, are supposed to be made for his own sake, and not for the sake of the landlord, he has no claim for the moneys which he may have expended for such purposes, at the end of the lease; except under a special stipulation to that effect. But if the tenant's occupation be terminated abruptly, and more particularly if his lease excludes assignees and sub-tenants, it is equitable that the landlord, getting the benefit beyond what was contemplated by the tenant, the family or the creditors of the latter should be allowed a proportion of the value of the ameliorations. Bell's *Princip.* s. 1255. The cases in which meliorations are or are not removable will be explained under FIXTURES (q. v.).

FENCIBLE, a word, of doubtful origin, meaning defensive. Regiments raised for local defence, or at—and only for—a special crisis, used to be denominated 'Fencible.' In the last French war, the local, as distinguished from the general militia, was called fencible, and many of the volunteer corps styled themselves the 'Royal ——shire Fencible Infantry.' The only regiment of this character still bearing the title is the 'Royal Malta Fencible Artillery,' although the Ceylon Rifle Regiment has also essentially the character of fencible.

FENCING may be described, for a general definition, as the art of defending one's own body or assailing another person's in fair fight by the aid of a side-weapon—i. e., by a sword, rapier, or bayonet. Technically, fencing is usually limited to the second of these; and works on the art touch only on attack and defence with the foil in pastime, and the rapier in actual personal combat. The present opportunity will, however, be taken to introduce the elements of single combat with foil, sword, and bayonet. The objection formerly existed that instruction in fencing encouraged a propensity to duelling; but as that absurdest of absurd customs has entirely ceased—at least in Britain—to demand its annual victims, no such objection now holds. Fencing may therefore be safely learned and taught as an elegant and manly accomplishment, developing gracefulness and activity, while it imparts suppleness to the limbs, strength to the muscles, and quickness to the eye. This regards fencing with the foils (the rapier has disappeared with the duels which employed it); but instruction in fencing with the sword and bayonet, while conferring the same advantages, has in addition the recommendation of helping to fit the student for taking an active part in any general national defence that political circumstances might render necessary. The Foil (q. v.) is a circular or polygonal bar of pliable and very highly tempered steel, mounted as any other sword, and blunted at the point by a 'button,' to prevent danger in its use. From its nature, the foil can only be employed in thrusting, and, being edgeless, it can be handled without liability to cutting wounds. The length of the blade should be proportioned to the height of the person using it—31 inches being the medium length for men, and 38 inches from hilt to point the maximum allowable. As a protection against accidental thrusts, the face is generally guarded by a wire-mask. The two portions of the blade are known as the 'forte' and the 'feeble;' the first extending from the hilt to the centre, and the other from the centre to the point.

In drawing, advance the right foot slightly to the front, take the scabbard with the left hand, raise the right elbow as high as the shoulder, seize the hilt with right hand, nails turned inward, and having drawn the foil, pass it with vivacity over the head in a semicircle, and bring it down to the guard (of which presently) with its point towards the adversary, not higher than his face, nor lower than his lowest rib. Simultaneously with the weapon being brought into position, the left hand with fingers extended should be raised to a level with the head, as a counterpoise in the various motions to ensue. In establishing the position of guard, the right foot must be advanced 24 inches before the left, the heels in a straight line, and each knee slightly bent, to impart elasticity to the movements, but not too much, lest the firmness of the position be diminished.

In fencing, there are three openings or entrances—the *inside*, comprising the whole breast from shoulder to shoulder; *outside*, attackable by all the thrusts made above the wrist on the outside of the sword; and the *low parts*, embracing from the armpits to the hips. For reaching and guarding these entrances, there are five positions of the wrist—prime, seconde, tierce, carte (quarte), and quinte. The most important, and those to commence with, are carte and tierce, from which are derived the subordinate positions of carte over the arm, low carte, and flanconnade or octave.

To engage is to cross swords with your adversary, pressing against his with sufficient force to prevent any manœuvre taking you unawares. To disengage is to slip the point of your sword briskly under his blade, and to raise it again on the other side, pressing in a direction opposite to that of the previous case.

The guard in each position is a passive obstruction to the opposing thrust; the parade is an active obstruction, in which the guard is first assumed, and the blade then pressed outward or inward by a turn of the wrist against the adversary's sword, so that when thrust at your body it shall be diverted from its aim, and held off. The parade may therefore be regarded as a mere extension of the guard. If the parade were called the 'parry,' it would convey its meaning more readily to English ears. Another, and perhaps more appropriate name for thrust, is the 'lunge' or 'longe,' as the thrust is almost always accompanied by a lunge forward of the right foot, to give at once greater force and longer command to the blow.

The following are directions for the principal guards and thrusts, which may also be seen depicted roughly in the sketches below.

Carte, Guard.—Turn wrist with nails upwards; hand on a line with lower part of breast; arm somewhat bent, and elbow inclined a little to the outside; point of foil elevated at an angle of about 15°, and directed at upper part of adversary's breast.

Thrust.—Being at the guard in carte, straighten the arm, raise the wrist above the head, drop the foil's point to a line with the adversary's breast, throw first the wrist, and then the whole body, forward by a lunge with the right foot of two feet from the 'guard,' the left foot remaining firm. The left hand should be dropped during the lunge to a level with the thigh, and to a position distant about a foot from the body; it will then afford a good counterpoise to the sword-arm. During the whole action, the body must be perfectly upright. When performed briskly, it appears that the point and foot are advanced simultaneously, but in fact the point has, or should have, priority, in order that the instantly following lunge may drive it home. Most of these observations concerning thrust in *carte* apply equally to all other thrusts.

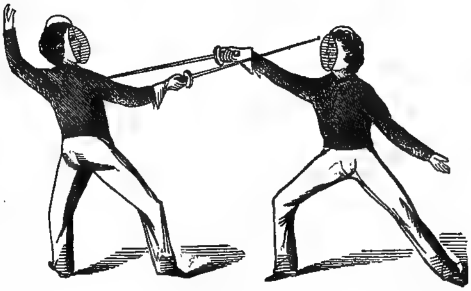


Fig. 1.—Carte.

Carte over the arm is a variety of this thrust. The sword is driven outside the adversary's blade, from the carte position, but in the tierce line.

Low Carte.—Engage adversary's blade in carte, then drop point under his wrist, in a line to his elbow, and thrust at his flank, the body being considerably bent.

Flanconnade or Octave.—Engage adversary's blade in carte, and bind it with yours, then carry your point behind his wrist and under his elbow: without quitting his blade, plunge your point to his flank.

Tierce, Guard—As in carte, the nails and wrist being somewhat more downward, and the arm stretched a little outward, to cover the outside.

Parade.—Move arm, from the guard, obliquely downward to the right about six inches, and oppose the inside of the adversary's blade.

Thrust.—From the guard, turn wrist with nails downward, the same height as in carte, the inside of the arm in a line with the right temple; then thrust and lunge as in carte.

Seconde, Parade.—Nails and wrist downward, hand opposed outward, and blade, pointing low, should form an angle of about 45° with the ground.

Thrust—The same as tierce, but delivered under the adversary's wrist and elbow, to a point between his right armpit and right breast: the body to be more bent than in carte or tierce.

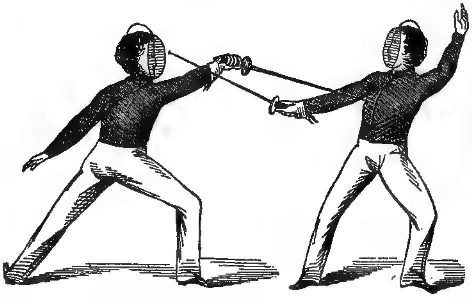


Fig. 2.—Tierce.

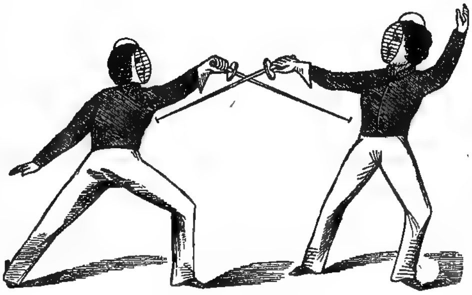


Fig. 3.—Seconde.

Prime, Parade.—In using prime to parry the thrust in seconde, pass your point over the adversary's blade, lower it to the waist, keeping your wrist as high as your mouth, nails downward, elbow bent, and body held back as far as possible. The left foot should also be drawn backward a few inches, to remove the body further from the hostile point.

Thrust.—An extension movement from the parade.

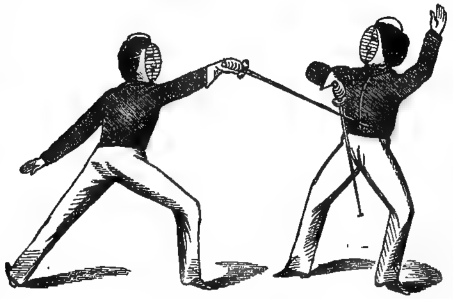


Fig. 4.—Prime.

Quinte, Parade.—Wrist in high carte, sword-point low, and oppose adversary from the forte of the outside edge of your blade.

Thrust.—Make a feint on the half-circle parade, with the wrist in carte; disengage your point over the adversary's blade, and thrust directly at his flank.

Half-circle, Parade—One of the principal defensive parades: straighten arm, keep wrist in line with shoulder, nails up: by quick motion of wrist sweep point from right to left in a circle covering your body from head to knee, until the adversary's blade is found and opposition established.

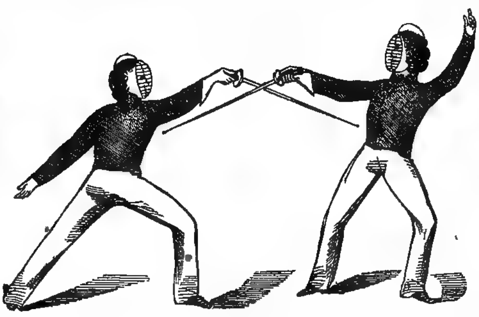


Fig. 5.—Quinte.

The parades parry thrusts as follows:

Carte, with wrist low, parries low carte and seconde; with wrist raised, all the thrusts over the point on the inside of the sword and the flanconnade.

Tierce parries high carte; with raised wrist, parries tierce.

Seconde parries all lower thrusts, both inside and outside.

Half-circle parries carte, high carte, tierce, and seconde.

Prime parries carte, low carte, and seconde.

Quinte parries seconde and flanconnade.

In all parades or parries, care must be taken that in covering the side attacked, the parade is not so wide as to expose the other side to the enemy. A steady countenance, shewing no disquietude at any attempt he may make, is, above all, necessary in parades.

Every parade has its return, which should be made with vivacity and decision. A thrust can be returned when the adversary thrusts, or when, baffled in his attack, he is recovering to his guard. In the first case, no lunge is necessary, the return being made from the wrist: this return requires great skill and quickness, since the adversary should receive the thrust before, by finishing his own, he has touched your body.

Ordinary Returns.—After carte parry, return in carte; after tierce, return in tierce; after parrying high carte, return seconde; after parrying seconde, return in quinte; after parade in prime, return seconde or low carte.

Feints, of which there are many varieties, consist in threatening an attack on one side of the sword, and then executing it on the other. The best parade against a feint is that of the half-circle, which will be sure to find the adversary's point.

Advance and Retreat are motions of attack or withdrawal, performed by advancing the right, or withdrawing the left foot suddenly about 18 inches, and instantly following it with the other foot. As the adversary advances, you must retreat, unless prepared to receive him at the sword-point.

Salute.—The salute is a courteous opening of the fencing, and consists in gracefully taking off the hat, while, with the foils, your adversary and yourself measure your respective distances.

Appels or beats with the right foot, *beats* on the adversary's blade, and *glissades* or glidings of one sword along the other, are motions intended to confuse the enemy, and give openings for thrusts.

Voltes, *demi-voltes*, and *disarming*, were manœuvres formerly taught with care, but they are now quite discarded in the academies of England and France, as useless and undesirable.

In Spain and Italy, considerable differences of practice from that in France and England prevail. The left hand is used as an auxiliary in parrying, and in Italy is aided by a dagger, or sometimes a cloak. The Spaniard, though trusting to his sword and left hand only, has his blade five feet long, with sharp edges; his guard is nearly straight, and one of his favourite attacks is by a *cut* (not thrust) at the head.

In an article limited in length as this must necessarily be, it is impossible to give more than the merest outline of the various motions; but, of course, in actual practice, there are endless variations of the different modes of attack and defence, which will be severally adopted according to the skill and option of the fencer. There is no finer indoor exercise than fencing, as the muscles in every limb are developed and strengthened by it. The great requirements for success are a steady eye and hand, a quick purpose as quickly executed, and, perhaps above all, perfect equanimity of temper.

THE SWORD EXERCISE differs from fencing with the foil; in that, the weapon employed has one cutting edge as well as a point, and is therefore intended to cut and thrust. The sword is the arm of all officers in the army and navy, of many non-commissioned officers, and constitutes the sole mode of attack and defence for the officers of the British volunteers. A certain degree of proficiency in its use is therefore always serviceable. In practice, the usual substitute is a stout, straight stick, called a 'single-stick,' having a basket-handle to protect the knuckles.

The position of the combatant is the same as that assumed in fencing with the foil; the lunge is similar, as are also the 'advance' and 'retreat,' and other minor points. According to the instructions of drill-masters, there are seven cuts, with seven corresponding guards, and three thrusts. The theoretical directions of all these are shewn on the accompanying diagram, which represents a target placed opposite a pupil, so that he may see the motions he is expected to perform displayed before him. The centre of the target is supposed to be in a line with the centre of his breast.

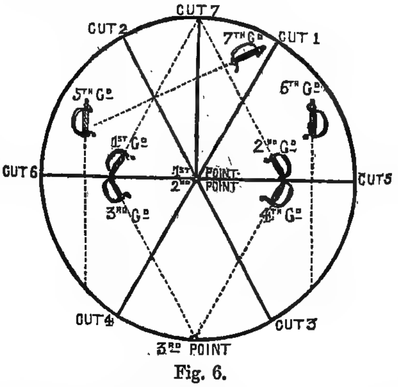


Fig. 6.

The cuts proceed from the circumference towards the centre along the *thick* lines. Nos. 1, 3, and 5 are inside cuts, and attack the left cheek, left side, and inside of the right leg respectively; 2, 4, and 6 are outside cuts, attacking the enemy's right cheek, right side, and right leg on the outside. No. 7 is a vertical cut, aimed at the head.

The dotted lines shew the position of the sword in the several guards by which the cuts are opposed. The sword-handles illustrate the situation of the right hand with reference to the centre of the body.

The points or thrusts are shewn by the black circles. That towards No. 1 should be directed with the wrist and edge of the sword upwards to the right; towards 2, with the edge upwards to the left; and in the 3d point, with the wrist rising to the centre, and the edge upwards to the right.

The 'parry' is an additional defensive movement, and consists in bringing the wrist nearly to the right shoulder; whence, as centre, a circular sweep of the sword is made from left to right.

A considerable latitude is allowable in regard to the cuts, as to the part of the adversary's body at which they are directed, provided the general inclination of the blow be observed; similarly, the cut may at times be parried by a guard other than that intended specially for it, according to the discretion of the fencer.

In engaging, or joining swords, with the enemy, press the blades but lightly together, so that the hand and wrist may be readily susceptible of any motion. In making the guards, care must always be taken to receive, if possible, the feeble of the enemy's blade on the forte of your own, so as to offer the greater opposition. It should also be borne in mind that, in all cuts at the leg, when at proper distance, the shifting of your own leg, and delivering a cut at the same moment, becomes the most effectual and advantageous defence, particularly if you happen to be taller than your adversary, as you will then probably be out of his reach, while he is within yours.

In contending with bayonet or pike, the most effectual guard is the 5th, which, if well timed, enables the swordsman to seize the musket or pike with his left hand, and then make the 6th cut at his opponent's neck. In an encounter with the rapier, the best cuts are Nos. 3 and 4, as they attack the enemy's arm, which must be advanced within reach before he can touch your body, and also constitute a defence against his thrust. If the enemy—no matter how armed—be on horseback, the dismounted swordsman (provided he have proper nerve and agility) has decidedly the advantage. Endeavour to place yourself on his left, where he has less power of defending himself or his horse, and cannot reach to so great a distance as on his right: an attack on the horse will probably render it ungovernable, and it becomes easy then to avoid the rider's blows, while he himself may be attacked with impunity in almost any direction.

BAYONET EXERCISE.—If the sword exercise be of use to volunteer officers, there are (1862) thirty times as many volunteers themselves to whom a proper command of the bayonet is indispensable. In close-quarter engagements, there is no weapon more formidable: from its length and weight, the thrust of the bayonet gives a terrible wound, and its force is such that there is great difficulty in parrying the attack. Like other small-arms, it is most serviceable when handled on scientific principles; and the art of using it to advantage is so simple as to be very easily acquired, while the exercise, from the weight of the rifle, admirably aids in developing the muscles of all parts of the body.

Of course, the bayonet is always fixed at the end of the musket, when it becomes virtually a pike. The position of the feet in the bayonet exercise remains always the same relatively, and absolutely until advance or retreat be effected. The right foot is thrown back 24 inches, and the weight of the body thrown upon it. The heels are kept in a line with each other, both knees bent and well apart; the right knee directly over the foot, the left easy and flexible, pointing to the front. In this position of the body, all the defensive motions of the bayonet are made. In 'guard,' the bayonet is brought nearly to a horizontal direction, level with the waist, and pointing towards the breast of an advancing enemy. Similarly, to 'guard,' the positions 'low,' 'high,' and 'second point' are assumed, the bayonet pointing as shewn by the dotted lines in fig. 7. The butt of the rifle is always kept well to the right side, the hand behind the trigger-guard, and the whole body in attitude to offer great resistance. In 'low,' the barrel is turned downwards; but in all the other defensive motions it is held upwards. The position of the arms is in each case that which would naturally be taken in placing the bayonet and musket in the required direction.

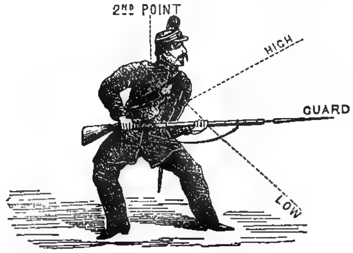


Fig. 7.

The offensive position of the body is acquired by the extension of the right leg, and bending forward of the left without moving the feet. The butt of the rifle is at the same time pressed firmly to the shoulder. This position is called 'point,' and constitutes an extension of the weapon in a direction parallel with either of those previously taken. As there were four 'guards,' so there are four points, which are shewn in fig. 8. The barrel is in each case upward, and the motions for each are similar, except in pointing from '2d point,' when the rifle, seized by the right hand round the small of the butt, is thrust straight up above the head to the full extent of the arm, the left hand falling along the thigh, and the legs being straightened so as to form an isosceles triangle.

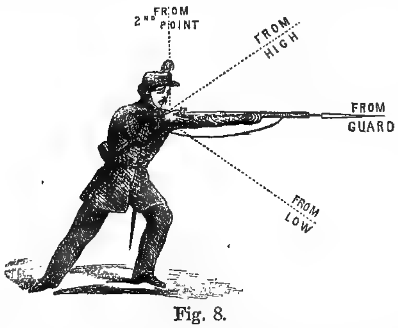


Fig. 8.

'Shorten arms' is a useful motion, both as a defence and as a preparation for a strong attack. It consists in carrying the butt back to the full extent of the right arm, while the barrel (downwards) rests upon the thick part of the left arm. The body is thrown upon the right leg, and the left straightened. This powerful position is seen in the annexed cut.

In all the guards and points, and also 'shorten arms,' the bayonet may be turned directly to the front, to the right, or to the left, as circumstances may suggest. In contending with a swordsman, the action of changing from right to left, when at the 'high' or 'low,' is sufficient defence against the ordinary cuts of the latter.

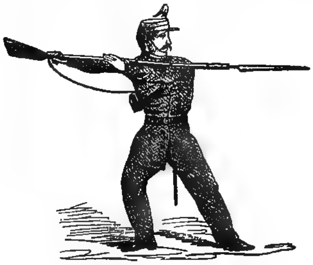


Fig. 9.

Among the treatises consulted for this article have been the works on fencing by Angelo and Roland, as well as the shorter instructions issued by the military authorities.

FENELON, Francis de Salignac de la Mothe, was born, August 6, 1651, in the château Fenelon, province of Perigord, now included in the department of the Dordogne, of a family which has given many celebrities both to the church and to the state in France. His education was conducted at home up to his 12th year, when he was transferred to Cahors, and afterwards to the Plessis College in Paris. At the close of a most blameless collegiate career, he selected the church as his profession, and entered, in his 20th year, the newly founded seminary of St Sulpice, then under the direction of the celebrated Abbé Tronson, where he received holy orders in 1675. Unlike but too many ecclesiastics of his own rank at that period, he gave his whole heart to his sacred calling. For some time after his ordination, he was employed in attendance at the hospitals, and in other parochial duties of the parish of St Sulpice; and in the year 1678, he was named director of an institution recently founded for the reception of female converts to the Roman Catholic faith, in Paris. During his tenure of this office, he wrote his first work, *On the Education of Girls*, which is still a standard authority; and the gentleness, moderation, and charity with which he discharged his duties towards the young converts, led to his appointment as head of a mission, which, on the revocation of the Edict of Nantes in 1685, was sent to preach among the Protestant population of Saintonge and Poitou. In 1688, he resumed his duties in the Maison des Nouvelles Converties, at Paris; and in the following year, he was named by Louis XIV. to the highly confidential post of preceptor of his grandson, the young Duke of Burgundy. F.'s management of this most important and delicate trust shewed how well he understood the true nature and objects of education. All his own instructions, and all the exercises enjoined upon his pupil, were so contrived, as, while they imparted the actual knowledge which it is the ordinary business of a master to communicate, at the same time served to prepare the mind and the heart of the pupil for what was to be the real business of his life, by impressing upon him a sense of the responsibility which awaited him, of the great principles of truth and justice upon which these responsibilities are founded, and of the hollowness and futility of all earthly glory, power, and happiness, which do not rest upon this foundation. To this wise design of the preceptor we are indebted for many works still popular in educational use; for the *Fables*, for the

Dialogues of the Dead, for the *History of the Ancient Philosophers*, for the germ at least of the *Telemachus*, and for the *Life of Charlemagne*, the manuscript of which last work, unfortunately, was burned in the fire which destroyed the archiepiscopal palace of Cambray in the year 1697. As an acknowledgment of these great merits, he was presented by the king, in 1694, to the Abbey of St Valery, and in the following year, to the Archbishopric of Cambray, which he only accepted on the express condition, that for nine months of each year he should be exempted from all duties as preceptor of the prince, and left at liberty to devote himself exclusively to the care of his diocese. It is to this period of F.'s life that the history of the unhappy controversy about Quietism belongs. Without entering into the details of this singular revival of the ancient Mysticism (see MYSTICISM), it will be enough to say that two separate schools of Quietism are to be distinguished, the moral character, or at least the moral tendency, of which was exceedingly different. See QUIETISM. In one of these, the common mystic principle of the absorption of the soul in the love and contemplation of God, led to the conclusion, that the soul, in this state of absorption, became entirely passive; that it was thenceforth independent of the external world; that it suffered no contamination from the material actions of the outer man, and that no acts of virtue, not even of prayer, were any longer required. See MOLINOS. The other school, while it maintained the theory of passive contemplation and love, yet repudiated the dangerous and immoral consequences which were deduced therefrom. It was exclusively the latter and less objectionable form of Quietism, the professors of which for a time claimed, although not the patronage, yet at least the indulgent consideration of Fenelon. He formed, in the year 1687, the acquaintance of the celebrated Madame Guyon, who may be regarded as the foundress of the French school of Quietism. See GUYON. The extraordinary piety and exemplary life of this remarkable woman, and his own natural bias towards the tender and lofty spirituality which she professed, appear to have blinded F. to the true nature and to the practical consequences of the system which she followed. Fully convinced of the unfairness of much of the outcry which was raised against her, and which made her responsible for all the principles of the grosser Quietism of Molinos, his generous mind was perhaps attracted to her cause by the very injustice of her opponents. He advised her to submit her works to the judgment of Bossuet, who was then in the zenith of his fame, and with whom F. was in the most friendly relations. In the condemnation of the book of Madame Guyon by this prelate, F. acquiesced; but as she made a formal submission to the church, he refused to join in any condemnation of herself personally. Nevertheless, when a commission was appointed to examine the whole affair, F., although not a member, took a part in the proceedings; and he even suggested certain changes in their report, which he subscribed in common with the rest. To the articles prescribed for her signature by this commission, Madame Guyon readily subscribed; but it was further considered necessary not only to publish a condemnation of her several works, but also to prepare a special exposition of the true doctrine of the church on these questions. When the work of Bossuet on this subject was completed, he submitted it to F. for his approval. This F. not only refused to give, but even composed his own *Maxims of the Saints in the Interior Life*, in explanation and defence of certain at least of Madame Guyon's doctrines. He submitted his book to the Archbishop of Paris, and introduced into it some modifications which were suggested by the diocesan censors, cheerfully agreeing to the stipulation of the archbishop, that it should be kept back from publication until the completion of the rival treatise of Bossuet, *On the States of Prayer*. An unfortunate violation of this engagement, committed without the knowledge, and in the absence of F., was the last of a long train of causes which led to the painful and disedifying rupture between these two great prelates. F.'s book was received with much clamour, that of Bossuet was universally approved; and in the controversy which ensued, all the weight of the displeasure of the court, which F. had provoked by the covert strictures upon the existing state of things, in which he was believed to have indulged in his works of fiction, was brought to bear against him. He was ordered to submit his book to the judgment of an ecclesiastical tribunal, of which Bossuet was a member. F. refused to accept Bossuet as judge, on the ground that he had already prejudged the cause; and in the end he appealed to the judgment of the holy see. Unfortunately, even while the affair was pending at Rome, the controversy was still maintained in France. Bossuet published a succession of pamphlets. Several of the bishops who had espoused the side of Bossuet, issued pastorals in the same sense. F. defended himself vigorously against them all in several publications, explanatory as well of his principles as of the personal imputations in which some of his adversaries did not scruple to indulge. The last blow against the ancient friendship of the great rivals was struck by Bossuet in his celebrated *Relation sur le Quiétisme*. F. was wounded to the heart. The copy of Bossuet's pamphlet which first came into his hands is still preserved in the British Museum; and the margin is literally filled with remarks, annotations, replies, denials, and rejoinders, in the singularly delicate and beautiful handwriting of the indignant archbishop. The copy now in the British Museum is most probably one which, as we learn from his correspondence, he sent to his agent at Rome, and on the margin of which he corrected, for the guidance of his friend, the many false and exaggerated charges of his great antagonist. The substance of these replies he gave to the public in a most masterly defence, written, printed, and published within little more than a fortnight from the appearance of Bossuet's *Relation*. From this point, the controversy assumed a more personal, and therefore a more acrimonious character; and it was maintained on both sides till the long delayed decision of the pope brought it to a close, March 12, 1699, by a brief, in the usual form, condemning the *Maxims of the Saints*, and marking with especial censure 23 propositions extracted from it. The conduct of F. under this blow constitutes, in the eyes of his fellow-churchmen, one of his highest titles to glory. He not only accepted, without hesitation, the decision of Rome, but he took the very earliest occasion to publish from his own pulpit the brief of his condemnation; he issued a pastoral address to his flock, to apprise them of the judgment of Rome, and of his own cheerful acquiescence; and he presented to his cathedral a magnificent piece of church-plate, a gold ostensory, in which the Angel of Truth is represented trampling under foot many erroneous works, the most prominent of which bears the title of *Maxims of the Saints!* Bossuet is said to have been greatly touched by the conduct of his noble adversary, and to have earnestly desired a reconciliation. But the adverse influence of the king, Louis XIV., and of the court, stood in the way. The jealousy with which the political principles of F. were already regarded was heightened about this time into open hostility by the appearance of his *Telemachus*, which was printed from a copy surreptitiously obtained by his servant, and which the king regarded as but a masked satire upon his own court: Sesostris being supposed to represent the Grand Monarque himself; Calypso, Madame de Montespan; Protesilaus, Louvois; and Eucharis, Mademoiselle de Fontanges. Louis's anger knew no bounds. F. was strictly restrained within his diocese; measures were taken to give the condemnation of his book every character of publicity; and what wounded him most of all, all intercourse with him, whether personal or by letter, was forbidden to his old and much-loved pupil, the Duke of Burgundy. From this date, F. lived exclusively for his flock. He founded at Cambray a seminary for his archdiocese, which he made his own especial charge. He was assiduous in preaching, and in the discharge of the other duties of his office; and the fame of his benevolence, charity, and enlightened liberality is attested by the order given in the campaign of 1709 to spare the palace and the stores of the Archbishop of Cambray. The only later controversy in which he appears is the revival of the Jansenistic dispute in the well-known form of 'The Case of Conscience' (see Jansenism), in which F. engaged earnestly on the side of orthodoxy. Notwithstanding the prohibition of his grandfather, the young Duke of Burgundy retained all his old affection for his preceptor; and the highest hopes were entertained as to the future career of the pupil of such a school. These hopes were unfortunately cut short by the premature death of the duke in 1712. F. survived him but a short time. He died January 7, 1715.

The works of F. are very voluminous. The latest collected edition extends to twenty 8vo volumes, and embraces every variety of subjects—theology, philosophy, history, literature, ancient and modern, oratory, especially the eloquence of the pulpit, asceticism, and spirituality in all its branches. His correspondence is very extensive and most interesting. Of his early sermons (one of which was delivered in his 15th year), a volume was printed in 1744. Of his mature discourses, two only have reached us in a finished state. They are of the very highest order of sacred eloquence. Of the rest, we can only judge from the skeletons which it was his habit to prepare with great exactness, and of which very many have been preserved. His literary and historical works, many of which were composed for the instruction of his pupil, are filled with allusions and suggestions illustrative of the principles of government and of the relative duties of sovereigns and subjects, far in advance of the time in which he lived. His work on the *Temporal Power of the Medieval Popes* presents that doctrine in a form which divests it of many of those characteristics which are most objectionable in the eyes of Protestants; and even his spiritual writings in general may be read, and indeed are not unfrequently read, not only without offence, but even with positive advantage, by Christians of all denominations. See Card. Gaussett's *Vie de Fenelon*, 4 vols. 12mo; also the *Vie de Bossuet* of the same author. See also the Life prefixed to the collected edition of the *Œuvres de Fenelon;* the voluminous correspondence contained in that collection; and above all, the *Vie de Fenelon*, recently published, by one of the Sulpician congregation (M. Gosselin), in four large 8vo volumes.

FENESTE'LLA, or **FENESTRELLA**, a genus of Polyzoa, resembling the recent 'lace coral,' very common in Palæozoic rocks, ranging from the Lower Silurian to the Permian. Thirty species have been described.

FE'NNEC, or **ZERDA** (*Megalotis*), a genus of *Canidæ*, peculiar to Africa, resembling foxes in general form and in the bushy tail, but having eyes adapted for diurnal and not for nocturnal vision, and remarkably large ears. The species are small and beautiful. They feed partly on dates and other vegetable food, also on eggs, and on insects, which they adroitly snap as they pass.

FE'NNEL (*Fœniculum*), a genus of umbelliferous plants, allied to Dill (q. v.), but distinguished by the cylindrical strongly ribbed fruit. The flowers are yellow. All the species are aromatic, and have much divided leaves with thread-like segments. The best known is the Common F. (*F. vulgare*), a native of the south of Europe and of some parts of England. It is a biennial, three or four feet high, and is cultivated in gardens, chiefly for the sake of its leaves, which are boiled, and served up with mackerel, with salmon, and occasionally with other kinds of fish, or are employed to form a sauce for them.—Sweet F., Italian F., or Cretan F. (*F. dulce*), is a plant of much humbler growth, and annual, much cultivated in the south of Europe, but too tender for the climate of Britain. The young sprouts from the root are sweeter and less aromatic than those of Common F., and when blanched, are a very agreeable salad and potherb. The fruit (seed) is longer and paler than that of Common F., has a more agreeable odour and flavour, is the favourite aromatic condiment of the Italians, and is used in medicine as a carminative and aromatic stimulant. *Oil of F.*, an aromatic, stimulant, and carminative essential oil, is also made from it.—Cape F. (*F. Capense*), found in the interior of the Cape of Good Hope, has a thick, aromatic, esculent root.—The Panmuhooree of India (*F. panmorium*) is a species of F. much cultivated in its native country for its sweet, warm, and aromatic fruit, which is much used as a carminative, and in curries.—The Giant F. of the south of Europe is a plant of a different genus (*Ferula*), and abounds in a fetid juice. It is indeed closely allied to asafœtida, but forms a favourite food of buffaloes in Apulia, where it particularly abounds. The dry dead stem is full of a white pith, which is used in Sicily as tinder.

Fennel (*Fœniculum vulgare*):
a, a flower.

FENS. See Bedford Level; also Marshes.

FE'NUGREEK (*Trigonella*), a genus of plants of the natural order *Papilionaceæ*, sub-order *Leguminosæ*, allied to clover and melilot. The leaves have three obovate leaflets and scythe-shaped stipules. The flowers generally have the *keel* very small, so that the *wings* and *standard* present the appearance of a tripetalous corolla. The COMMON F. (*T. fœnum Græcum*) is a native of the south of Europe, and of some parts of Asia; it is much cultivated in India as a fodder-plant, and derives its name (*Fœnum Græcum*, Greek hay) from its use as fodder in Greece.

Fenugreek (*Trigonella fœnum Græcum*).

Its pods are many-seeded, and cylindrical; its seeds have a strong peculiar smell, and an oily bitter taste; the flour made from them is used for emollient poultices, but only in veterinary practice. The seeds of F. were formerly held in great esteem in medicine.—Another species (*T. incisum*), growing spontaneously in many parts of India, is much used as fodder for cattle. The legumes of the ESCULENT TRIGONELLA (*T. esculenta*), also an Indian plant, are used as human food. One species only, the BIRD'S FOOT F. (*T. ornithopodioides*), is a native of Britain, a small plant, growing in sandy pastures near the sea, and not very common.

FENYES, ELEK (Alexius), a Hungarian geographer and statistical author, was born in 1807 at Csokaj, in the county of Bihar. After the usual career of studies in philosophy and law, F. became barrister-at-law as early as 1829; but instead of frequenting the law-courts, he began travelling all over the country, with the purpose of making himself thoroughly acquainted with the state of the Hungarian kingdom, of which there had never before been an authentic survey. The first fruits of F.'s enterprise appeared in 1840, under the title, *Hungary and its Annexed Parts, Geographically and Statistically considered* (6 vols., Pesth). The great prize of 200 ducats was awarded to the author by the Hungarian Academy. *The Statistics of Hungary*, in 3 vols., followed (1843); *General Atlas for Hungary* (1845); *Description of Hungary* (1847); *Geographical Dictionary of Hungary* (1851)—all of which were published at Pesth. The whole of F.'s works are written in the Magyar tongue, but several of them have been translated into German, and repeatedly published. Besides that these works are the first true expounders of the state of Hungary, it is also generally admitted that, as to their completeness, solidity, and exactness, they will bear a comparison with the best of kindred works in European literature. During the national government of Hungary (1848), F. was made the chief of the statistical section. After a respite of several years, from failing health, F. is again busily engaged in the periodical press, and is editor of the *Farmers' Journal* (A Falusi Gazda).

FEODO'SIA, or **THEODO'SIA**. See KAFFA.

FEO'FFMENT (*infeudare*), the oldest, and for a long period the only, method for the conveyance of land known in England. Feoffment consisted in the formal conveyance of the land from the feoffer to the feoffee, the former stating distinctly the measure of the estate conferred, whether it was in fee, in tail, or for life. Where no mention of the duration of the estate was made, the gift was presumed to be for life. This conveyance of the land, in order to be complete, required to be accompanied by delivery of Sasine (q. v.). Livery of sasine was of two kinds—viz., by deed, and in law. In the former case, the parties being actually upon the land, the feoffor, by delivery of a twig or a turf, testified his conveyance of the land. In livery in law, the parties being in sight of the land, the feoffor referring to the land gave possession to the feoffee. This mode of feoffment was ineffectual unless the feoffee entered into possession during the life of the feoffor. Livery in deed might be effected by attorney; but livery in law only by the parties themselves. In the earliest times, these ceremonies completed the conveyance. But by degrees the practice of embodying the transaction in a deed was introduced. When a deed was used, it became customary, but not essential, to endorse on the deed the fact that livery of sasine had been made. By the statute of Frauds (29 Car. II. c. 3), it was declared that no estate created by livery of sasine, unless accompanied by writing, signed by the party or his agent, should be of any effect, except as an estate at will; and by 8 and 9 Vict. c. 106, s. 3, a feoffment is void unless accompanied by deed. The law formerly gave so great an effect to a feoffment, that even when the party ostensibly making the conveyance was not lawfully seised in the estate, the feoffment was sustained. This was called a tortious conveyance; the party in whose favour it was made was said to have acquired an estate by wrong, the rightful owner was disseised, and was left to his right of Entry (q. v.). But by the act last mentioned, this tortious effect of a feoffment was removed. It must be observed that the practice of feoffment above described, and which has existed in England from time immemorial, differed materially from the old form of investiture in use in strictly feudal times, and from that which still prevails in Scotland. In England, the transaction was simply a conveyance by the actual holder of the land to a new tenant, testified by certain ceremonies, but requiring no confirmation by a third party to complete it. But by feudal usages, every holder of land was the vassal of some superior lord, to whom he owed suit and service, and without whose consent he could not even part with his land; hence no conveyance was complete without the reception of the new tenant by the lord paramount as his vassal. In like manner, to this day, in Scotland, no transfer of heritage is complete without the formal confirmation of the superior; and although by recent legislation the old feudal usages, which for two centuries have existed as landmarks, telling us of a system now passed away, have been abolished, yet the fact of acceptance by the superior, and the performance of the pecuniary services attendant on that acceptance, are still preserved. See INFEFTMENT, SASINE, FEUDAL SYSTEM.

Feoffment to Uses.—This was an application of the feudal form of *feoffment* in England in order to effect a conveyance in trust. The common law courts, adhering to feudal rules, refused to recognise any interest in the land but that of the person actually infeft; but where a feoffment was made to one man *to the use* of another, the equity courts gave effect to the transaction by compelling the party infeft to hold in trust for the third person, called the *cestui que use*, who was said to have an equitable estate, in contradistinction to the legal estate which remained in the feoffee to uses. By the statute of Uses, it was enacted that in all such conveyances the actual legal estate should pass to the *cestui que use.* See Uses.

FER OLIGISTE is a mineralogical term applied to a variety of anhydrous red oxide of iron (Fe_2O_3), otherwise called *Specular Iron Ore.* The famous Swedish, Russian, and Elba iron are in greater part prepared from this iron ore. The natural position of fer oligiste is in the primary rocks. See Iron.

FE'RÆ (Lat. *ferus*, wild), in the Linnæan system of zoology, an order of *Mammalia*, nearly corresponding to the *Carnaria* (q. v.) of Cuvier.

FE'RÆ NATU'RÆ (Lat. of a wild nature). Those animals which flee the dominion of man, whether beast, bird, or fish, and retain their natural freedom, are thus characterised in the Roman law. According to that system, such animals became the property of any one who might catch them, irrespectively of the ownership of the soil on which they were taken, on the principle that 'natural reason gives to the first occupant that which has no owner.' —*Inst.* ii. tit. i. s. 12. But this regulation did not prevent the prohibition of trespass. 'Of course, any one who enters the ground of another for the purpose of hunting or fowling, may be prohibited by the proprietor, if he perceives his intention of entering' (*Ib.*). This right on the part of the proprietor did not affect the property of the animal taken, though it gave him an action against the trespasser. If a wild animal escaped from its captor, his proprietorship instantly ceased, and the animal might again be appropriated by its captor. This occurred even though the animal was not out of sight, if it could not be pursued without great difficulty. Even a wounded animal was not the property of the sportsman till it was caught, though the point which is decided in this sense (*Inst.* ii. tit. i. s. 13) is said to have been one on which difference of opinion had prevailed. Except in so far as it is modified by the statutes, which will be explained under Game-laws, these provisions form part of the common law both of England and Scotland. Animals which are said to be feræ naturæ, or of a wild and untamable disposition, any man may seize upon and keep for his own use or pleasure; but if they escape from his custody, though without his voluntary abandonment, it naturally follows that they return to the common stock, and any man else has an equal right to seize and enjoy them afterwards (Stephen's *Blackstone*, i. 161). The law of Scotland followed the law of Rome so closely in this, as in other respects, that the passage from the *Institutes* of Justinian above referred to was translated into one of the oldest collections of Scottish laws—that, viz., contained in the Cromortie MS., the date of which may be assigned to the latter part of the 14th c., and which certainly is not later than the reign of Robert III. (Irvine's *Game-laws*, p. 20, and statutes published by the Record Commission, Appendix v. p. 385); see also Stair, ii. 1, 5, and 33; and Ersk. ii. 1, 10. Under animals, feræ naturæ, the law of Rome included *bees*, unless included in a hive, or *skep*, as it is still called in Scotland, or unless the proprietor be in pursuit of them, and has kept them in sight. See Bee. Domestic animals, though they stray, do not cease to be the property of those to whom they have belonged; but as regards animals which have a tendency to return to a state of nature, the rule of the Roman law was, that property in them continued so long as they had the intention of returning (*animum revertendi*), or rather, one would imagine, the habit of doing so. This rule applied to peacocks and pigeons, but not to fowls and geese; with reference to which it was provided, that though they should be frightened and take to flight, they were still yours, though you might have lost sight of them, and that whoever detained them with a view to his own profit, was guilty of theft. See Dovecot, Warren, Forest, Fish.

FE'RDINAND I., emperor of Germany, 1556—1564, was born in Spain, 1503. He was the son of Philip I., and brother of Charles V., whom he succeeded in the empire in 1556, having been previously elected king of Rome. F. had married, in 1521, Anna, daughter of Ladislaus VI., king of Bohemia and Hungary. When her brother Louis fell in 1526 in battle with the Turks, leaving no issue, the crown was claimed by F. in right of his wife. This involved him in a long and bloody struggle with a rival, John of Zapolya, who laid claim to Hungary, and who, as well as his son Sigismund, was supported by Soliman, sultan of the Turks. F. at last gained the upper hand, bought off the Turks by a yearly tribute, and finally secured Hungary and Bohemia to the House of Austria. When he was elected emperor, the concessions he had made to the Protestants caused the pope, Paul IV., to refuse to acknowledge him. That pope dying, his successor, Pius IV., was more complaisant; but the electors resolved that for the future the consent of the pope should not be asked; and this was carried out. F. made several attempts to reconcile the Protestants and Catholics, and urged, though fruitlessly, the reformation of abuses on the Council of Trent. He died in 1564, leaving the reputation of a prudent and enlightened ruler, and was succeeded by his son, Maximilian II.

FERDINAND II., emperor of Germany, 1619—1637, was born at Gratz, 9th July 1578. He was grandson of Ferdinand I., his father being Charles, Archduke of Styria, the younger brother of Maximilian. F.'s mother, Maria of Bavaria, early inspired him with hatred against the Protestants. He was educated by the Jesuits at Ingolstadt, along with Maximilian of Bavaria; and at Loretto, he had taken a solemn oath, before the altar of the Mother of God, to reinstate Catholicism as the sole religion of his dominions, at any cost. As soon as he succeeded to the government of his own duchy of Styria, he set about putting down Protestantism by force. He attempted the same in Bohemia and Hungary, of which countries he had been elected king during the lifetime of Matthias Corvinus; but though at first unsuccessful, and even in danger of losing his dominions, he ultimately managed, with the aid of the Catholic league and of the Elector George I. of Saxony, to subdue them. Bohemia lost all its privileges. By hanging, confiscation of property, and the banishment of innumerable families, the wretched land was reduced to obedience; and the introduction of the Jesuits, and rigorous persecution of Protestants, re-established Catholicism. Meanwhile, F. had been elected emperor of Germany (1619). The war, which properly ended with the subjugation of Bohemia, was at the same time transferred to the rest of Germany, and took the character of a religious war—the famous 'Thirty Years' War' (q. v.). The two imperial generals, Tilly and Wallenstein, were opposed by a confederacy of the Protestant states of Lower Saxony, with Christian IV. of Denmark at their head; but the confederates were defeated by Tilly at the battle of Lutter, in Brunswick, and forced to conclude peace (Lubeck, 1629). Confident in the ascendency which he had acquired, F., in the same year, issued an Edict of Restitution for the whole of Germany, taking away from the Protestants nearly all the rights they had acquired by a century of struggles; and the troops of Wallenstein and of the league were immediately set to work to carry it out in several places. But further proceedings were soon arrested by the dismissal of Wallenstein, on which the diet of the empire at Regensburg had insisted; and by the opposition of Richelieu, who put every wheel in movement to curb the power of the House of Austria. At this time also, a formidable opponent to the schemes of the emperor appeared in the person of Gustavus Adolphus of Sweden (q. v.). After the murder of Wallenstein, the connivance at which is an ineffaceable blot on F.'s memory, the imperial commander, Gallas, gained, 1634, the battle of Nordlingen, which had the effect of detaching Saxony from the Swedish alliance; but the ability of the Swedish generals, for whom Austria had none that were a match, and the open part that France now took in the contest, brought back the balance of victory so far to the Protestant arms, that when F. died, February 15, 1637, he had given up the hope of ever attaining his objects. His reign is one of the most disastrous in history; for Germany owes him nothing but bloodshed, and misery, and desolation.

FERDINAND III., emperor of Germany, 1637—1657, the son of Ferdinand II., was born 11th July 1608. He was not so much under Jesuitical and Spanish influence as his father. Having accompanied the armies in their campaigns after the death of Wallenstein, he had witnessed the miseries of war, and was inclined for peace; but the conflicting interests of the individual belligerents hindered any unity of view, and made it necessary to proceed with the contest. Thus was this miserable war protracted, ever extending in circuit, and increasing in devastation owing to the growing licentiousness of the soldiery. At last, in 1643, a congress met at Münster to arrange terms of peace, which was concluded in 1648, and is known as the Peace of Westphalia. At the diet of the empire, 1653—1654, the last presided over by an emperor in person, F. effected important alterations in the administration of justice. He died, 2d April 1657, shortly after concluding an alliance with Poland against Sweden. His son, Leopold I., succeeded him in the German empire.

FERDINAND I., emperor of Austria (1835—1848), eldest son of Francis I. by his second marriage with Maria Theresa of the House of Naples, was born at Vienna, 19th April 1793. He was from the first of a weak constitution, and was unfortunate in those to whom his education was intrusted. Yet he shewed on all occasions a goodness of heart, which was fostered by the example of his uncle, the Archduke Charles, to whom he was much attached. While crown-prince, he travelled through his Italian provinces, Switzerland, and part of France, and took great interest in manufacturing industry. In 1835, he succeeded his father on the throne. It was expected from his character that he would inaugurate a more liberal policy than his predecessors had pursued, but the absolutist principles that seem destined to rule for ever the Austrian cabinet, triumphed, and Metternich was allowed to carry on the government. It now became obvious that F. sadly lacked moral decision, and his 'goodness' exhausted itself in numerous acts of clemency and benevolence. Nevertheless, during his reign, the industry of Austria made a great advance, and the great network of railroads and highways was begun. The insurrection in Galicia, 1846, led to the annexation of Cracow to Austria. No country was more affected by the European movement that began in the winter of 1847—1848 than Austria, though the revolutionary storms that shook the empire cannot be attributed to any want of goodwill to his people on the part of Ferdinand, but only to a complete want of political wisdom. On the disturbances breaking out in March, he consented to the dismissal of Metternich, the appointment of a responsible ministry, and granted the outlines of a constitution. In May, he retired with his court to Innspruck, but was induced to return to the capital in August. At last, the October insurrection in Vienna made him again leave the palace of Schönbrunn, and retire to Olmütz, where, on 2d December 1848, he abdicated in favour of his nephew, Franz Joseph. He has since resided at Prague. He married, 27th February 1831, Caroline, daughter of Victor Emanuel I., king of Sardinia, but has no children.

FERDINAND THE CATHOLIC, 5th of Castile, 2d of Aragon, 3d of Naples, and 2d of Sicily, was born 10th March 1452. He was the son of John II., king of Navarre and Aragon; and in 1469 married, at Valladolid, Isabella, sister of Henry IV. of Castile. Even in the lifetime of his father, events were paving the way for the subsequent union of the two kingdoms of Castile and Aragon. On the death of Henry IV. of Castile in 1474, the Cortes refused to acknowledge the legitimacy of his daughter Juana, and proclaimed Isabella and her husband F. joint-sovereigns. A war ensued, in which they were completely successful. In 1479, F. becoming king of Aragon on the death of his father, the two kingdoms of Aragon and Castile were united in the persons of F. and Isabella. Isabella, however, as long as she lived, maintained her position as queen of Castile, and allowed her husband no other share in the government than the privilege of affixing his signature to the decrees, and of uniting his arms with her own. F.'s whole reign was an uninterrupted series of successful wars. In Castile, he distinguished himself by the effectual suppression of the banditti, who had become formidable in the confusion resulting from the civil wars. This he accomplished by re-organising and putting in force against them the *hermandad*, or brotherhood, a kind of Spanish militia, composed of the citizens and the country-people. But F., whose craft and vigour were quite Machiavelian, was not content with taking strong measures against the Castilian outlaws; he also resolved to break the power of the feudal nobility, and made good use of the *hermandad* in carrying out this design. Cities and towns were encouraged to make themselves independent of the nobles, who were deprived of many important privileges. Among other humiliations, they were subjected to the ordinary tribunals of justice. The establishment of the Inquisition in 1478—1480, although primarily and mainly intended to further 'religious' ends, likewise helped to lessen their influence. F. also strengthened his power by vesting in himself and his successors the grand-mastership of the military orders of Calatrava, Alcantara, and Santiago. In all his schemes, F. was ably seconded by his queen Isabella, and by the celebrated Cardinal Ximenes. The year 1492 was the most brilliant in his reign, and is one of the most important in the history of the material progress of the world. It was signalised by the discovery of America by Christopher Columbus, though the honour of having aided the great navigator belongs not to F., but to Isabella. The same year witnessed the capture of Granada, and the retreat of the last Moorish monarch into Africa. F., who had a true Spanish hatred of heresy, immediately issued an order for the expulsion of the Jews from the conquered kingdom; and, in consequence, 160,000—some say 800,000—of his new subjects were compelled to scatter themselves over Europe. This act was neither wise nor Christian, but it was in accordance with the religious barbarism of the age, and especially of Spain. It was followed, several years after, by the persecution and expulsion of the Moors—an act still more unwise than the former, for the Moors of Granada were unquestionably the most industrious, civilised, and refined inhabitants of the Peninsula. F. was as successful abroad as at home. He was victorious over Alfonso V., king of Portugal; while his general, Gonzalvo de Cordova, twice wrested Naples from the French—the second time in 1503—after which it remained permanently in F.'s possession. In the following year, Isabella died; and in 1505, he married Germaine de Foix, a niece of Louis XII. of France. He took part in the famous league of Cambrai formed against Venice in 1508; made himself master of various towns and fortresses in Africa; and in 1512, conquered the kingdom of Navarre; thus becoming monarch of Spain from the Pyrenees to the Rock of Gibraltar. He died at Madrigalejo, January 23, 1516; and was succeeded by his grandson, Charles V. To F. and Isabella Spain owes her unity and greatness as a nation; and, in the no less skilful hands of their successor, she exercised an imperial influence over Europe, which it required Luther and the Reformation to check. See Prescott's *History of the Reign of Ferdinand and Isabella of Spain* (1838).

FERDINAND VII., king of Spain, born 14th October 1784, was the son of King Charles IV. and the Princess Maria Louisa of Parma. Although he had the advantage of excellent preceptors, especially the Canon Escoiquiz, in his youth, yet the machinations of the notorious Godoy, minister of Spain, prevented him from enjoying any opportunities for the intelligent exercise of his faculties. A deliberate attempt was made by his mother and Godoy to degrade him into a lover of mere animal pleasures, that their influence and authority might be unrestrained. F. soon conceived an aversion to the minister, which was increased by his marriage in 1802 with the amiable and accomplished Maria Antonietta Theresa, daughter of Ferdinand I., king of the Two Sicilies. This lady, who endeavoured to maintain her husband's dignity, died, 21st May 1806, of grief, as is supposed, at the insults offered to her by Godoy, the king himself, and above all by the queen. Suspicions of foul play, however, were entertained by Ferdinand. Mainly for the purpose of gratifying their hatred towards Godoy, a number of the nobles, headed by the Duke of Infantado, assembled round the crown-prince. A false step that the latter now took proved the beginning of great misery to Spain. By the advice of the Canon Escoiquiz, he wrote a letter to Napoleon, in which he expressed a wish to marry the eldest daughter of Lucien Bonaparte. This letter fell into the hands of the minister himself, and the prince was in consequence arrested in the Escorial, 28th October 1807, and declared a traitor by a royal proclamation, written in Godoy's own hand, and addressed to the Council of Castile. The animosity of the people towards the minister led to the revolution of Aranjuez, and the king abdicated in favour of F., 19th March 1808. Almost immediately after, however, Charles wrote to Napoleon, declaring his abdication to be forced. Napoleon, who had designs of his own upon Spain, refused to recognise F. as king, but sent him an invitation to meet him at Bayonne. In spite of all warnings to the contrary, F. repaired to Bayonne, at which place he arrived on the 20th April, and was received with distinction by Napoleon. Meanwhile, however, the French troops under Murat had marched across the Pyrenees, and taken possession of the Spanish capital. The wretched squabbles and recriminations that now took place between Charles and his son, and which were encouraged by Napoleon, ended in F.'s renouncing the crown of Spain unconditionally, receiving for himself and his posterity an annual income of 600,000 francs from the crown revenues of France, and likewise the palace and parks of Navarre. The château of Valençay, belonging to Prince Talleyrand, was assigned to him as a residence, along with his brother Don Carlos, his uncle Don Antonio, the Canon Escoiquiz, and the Duke of San Carlos. Here his proceedings were watched with the utmost vigilance; and it was not till the end of the year 1813, when the splendid series of British triumphs in the Peninsula had made a longer occupation of the country by the French impossible, that Napoleon offered to reinstate him on the throne of Spain. On the 14th of March, F. returned to Spain, where he was received with every demonstration of loyalty and affection. Very unfortunately for Spain, and also for his own comfort, F. had, in the meantime, learned to associate liberalism with Jacobinism, and both with Bonapartism, so that, on his reaccession to power, he threw himself into the hands of the clergy and the reactionary portion of his nobility. Even before his arrival in Madrid, he refused to swear or accede to the constitution of the Cortes, as interfering too much with the free exercise of regal authority, though he promised another in its place. From the moment, however, that he assumed the reins of government, a series of transactions took place which excited the astonishment and disgust of all liberal-minded politicians in Europe. Instead of the promised constitution, there commenced a fearful system of persecution against all who were suspected of holding liberal opinions; and executions, imprisonment, exile, and confiscation of property reigned in all parts of the kingdom. The monastic orders, the Inquisition, and the rack were restored, and every expression of opinion rigorously repressed. At length, in January 1820, an insurrection broke out, and F. was compelled to restore the constitution of the Cortes of 1812; but the French government interfering by force of arms, absolutism was restored in Spain in 1823. In 1829, F. married the notorious Maria Christina. She was his *fourth* spouse. By the first three, he had no children. Maria, however, bore him two children: Isabella II., the present queen of Spain, and the Infanta Maria Louisa, who married the Duke of Montpensier. By the influence of Maria Christina, F. was induced to abrogate the Salique law excluding females from the throne, and to restore the old Castilian law of cognate succession. This step led to a dangerous combination among the adherents of the king's brother, Don Carlos, even during the lifetime of the former, and after his death, to a civil war. See DON CARLOS, ESPARTERO, &c. On the 20th June 1833, the deputies, Cortes, and grandees of the kingdom took the oath of fealty, and did homage to the Princess of the Asturias, and F. died on the 29th September of the same year.

FERDINAND I., king of the Two Sicilies, was the son of Charles III. of Spain, and born

12th January 1751. When Charles ascended the Spanish throne in 1759, F., though a minor, succeeded him on that of Naples under a regency. After his marriage, in 1768, with Maria Carolina, daughter of the Empress Maria Theresa, he fell completely under her influence, and lost all his former popularity. The queen and her favourite minister Acton (q. v.) ruled the kingdom. F. joined England and Austria against France in 1793, but in 1801 was forced to enter into a treaty with the First Consul. A subsequent violation of this treaty compelled him, in 1806, to take refuge in Sicily, under the protection of the English. A French army marched into Naples, and took possession of the kingdom, which Napoleon bestowed first on his brother Joseph, and afterwards on Murat. F. was reinstated by the congress of Vienna, and entered Naples, after Murat's flight, in June 1815. His queen had died in 1814. During the revolution of 1820, he was obliged to introduce the Spanish constitution of 1812, but abolished it next year with the help of Austrian arms. He, however, expelled the Jesuits, and abolished superfluous convents; acts that may, perhaps, partly atone for his bloody persecution of the republicans in 1800, and his general antipathy to enlightened principles of government. He died January 4, 1825; and was succeeded by his son Francis I., who died in 1830.

FERDINAND II., king of the Two Sicilies, was the son of Francis I. by his second wife, Isabella Maria of Spain, and was born 12th January 1810. He succeeded his father in 1830. The country was in the most wretched condition; and all eyes were turned to the young king, the beginning of whose reign was marked by various acts of clemency towards political enemies, and also by the introduction of reforms in the economy and government of the country. But it was not long before he began to listen to foreign counsels, which saw danger for the whole peninsula in liberal measures. From that time, Naples became the scene of incessant conspiracy, insurrection, bloodshed, and political prosecutions. Ferdinand yielded to the storm of 1848, and granted a constitution to both parts of his dominions; he was even obliged to take part in the war against Austria in Northern Italy. The Sicilians mistrusted, and with reason, the king's proceedings, and declared that he and his family had forfeited the Sicilian crown. F. followed the constitution so far as to call the chambers together, but quickly dismissed them, impatient of any interference with his authority. After the subjugation of Sicily in 1849, when the reaction began to set in all over Italy, he hastened completely to set aside the new constitution; while all who had taken any part in state reforms were subjected to those cruel persecutions that the Letters of Mr Gladstone have held up to the execration of the world. F. died 22d May 1859, and was succeeded by his son Francis II.

FERDINAND III., Grand Duke of Tuscany, and Archduke of Austria, was born at Florence, 6th May 1769. In 1790, he succeeded his father, Leopold II., in the government of Tuscany, when the latter obtained the imperial throne at the death of the Emperor Joseph II., Leopold's brother. F.'s rule in Tuscany was one of combined mildness and ability; and during his reign were inaugurated many judicial, economical, and legislative reforms: commerce was protected and encouraged; hospitals and asylums founded, good roads opened through the state, and the greatest attention bestowed on the welfare of his subjects, which an enlightened and good prince could exercise. A lover of peaceful progress, he remained strictly neutral in the first coalition against France, and was the first sovereign in Europe to recognise and treat diplomatically with the French Republic in 1792. In 1793, intimidated by the combined menaces of the Russian and British cabinets, F. was constrained to relinquish his neutral policy, and become a passive member of the coalition formed by the above governments against France. In 1795, on the French occupation of Piedmont, he speedily reassumed friendly relations with France. In 1797, in order to save his states from annexation to the Cisalpine Republic, F. concluded a treaty with Bonaparte on most unfavourable terms; undertaking to pay a war-levy to France, and to transfer to the Museum of Paris some of the chief master-pieces of the Florentine galleries, including the 'Venus de' Medici.' Owing to the continued intrigues of France in his states, F. was forced to seek an Austrian alliance, which furnished Bonaparte with a pretext for declaring war simultaneously against Austria and Tuscany. In 1799, F. retired to Vienna, leaving the French troops in occupation of Tuscany. In 1801, at the peace of Lunéville, he was forced to renounce all claim on Tuscany. In 1814, the peace of Paris reinstated him in Tuscany, and even restored his artistic treasures. He died 17th June 1824, leaving his states to his son Leopold II.

FERENTI'NO, a town of Italy, in the delegazion of Frosinone, and six miles north-west of the town of that name. Portions of the ancient walls, built in the cyclopean style of large irregular and polygonal blocks of limestone, and patched or surmounted with Roman masonry, no mortar having been used, are still extant. F. is the ancient Ferentinum, a city of the Hernici. Present pop. 8300.

FE'RGUSON, ADAM, a Scottish philosopher and historian, was born (1724) at Logierait, in Perthshire, where his father was parish minister. He studied at the universities of St Andrews and Edinburgh, and was appointed (1742) chaplain to the 42d Regiment, in which capacity he was present at the battle of Fontenoy, and is said to have charged the enemy sword in hand, among the foremost of the regiment. In 1757, he succeeded David Hume as keeper of the Advocates' Library in Edinburgh. He was next appointed professor in the Edinburgh University, first of natural philosophy, in 1759, and subsequently (1764), of moral philosophy—a subject which had always had great attractions for him. While holding this office, he accompanied the young Earl of Chesterfield (1774) on his travels on the continent; and in 1778—1779, he acted as secretary to the commission sent out by Lord North to try to arrange the disputes between the North American colonies and the mother-country. The state of his health induced him, in 1784, to resign his professorship, in which he was succeeded by Dugald Stewart. In 1793, he visited various parts of the continent; and on his return, took up his residence for some time at Neidpath Castle, in Tweeddale, and latterly in St Andrews, where he died, 22d February 1816. His chief works are—*Essay on the History of Civil Society* (Lond. 1767), *Institutes of Moral Philosophy* (Lond. 1769), *History of the Progress and Termination of the Roman Republic* (Lond. 1783), and *Principles of Moral and Political Science* (Lond. 1792). The work by which he is best known is his *History of the Roman Republic;* this, together with the Essay and Institutes, have gone through a number of editions. All his works have been translated into German and French, and the Institutes has been used as a text-book in several foreign universities. F. was distinguished for the decision and manliness of his character.

FERGUSON, JAMES, was born (1710) near Keith, a village in Banffshire, Scotland. His father being a poor day-labourer, he enjoyed only three months of instruction at school, and his subsequent acquirements were the result of his own insatiable thirst for knowledge. His tastes lay principally for practical mechanics and astronomy; and while keeping sheep, to which he was early sent, he was constantly employed in making models of mills, &c., and at night in studying the stars. After working at various country employments, he took to drawing patterns for ladies' dresses, and copying pictures and prints with pen and ink. He then supported himself and his parents by drawing portraits, first in Edinburgh, and afterwards (1743) in London; his leisure time being all the while given to astronomical pursuits. In 1748, he began lecturing on astronomy and mechanics with great acceptance. He was elected a Fellow of the Royal Society in 1763, and received from George III. a pension of £50. He now gave up portraits, and devoted himself to lecturing and writing on his favourite subjects. He died in 1776. F. was held in high esteem for the worth and amiability of his character, as well as for his extraordinary and self-taught acquirements. Few men have done more to promote a knowledge of the results of science, among those who have not the advantage of regular scientific training. His principal works are—*Astronomy explained upon Sir Isaac Newton's Principles* (1756; Sir David Brewster's ed., 2 vols. 1811); *Lectures on Mechanics, Hydrostatics, Pneumatics, and Optics* (1760); also edited by Sir David Brewster in 1805; and *Select Mechanical Exercises*, with an Autobiography (1773).

FERGUSSON, ROBERT, a Scottish poet, was born at Edinburgh about the year 1750, and received his education at the university of St Andrews, where he was in possession of a bursary founded by a person of his own name, and resided four years. Subsequently, he removed to Edinburgh, and was employed in the office of the commissary clerk. His poems were chiefly contributed to *Ruddiman's Weekly Magazine*, and gained him considerable local reputation. Unhappily, this reputation proved his ruin. His society was eagerly sought; and in that convivial time, he was led into excesses which permanently injured his health. He fell into a religious melancholy, and finally, through an accidental fracture of the skull, became totally deranged. He died on the 16th October 1774, at the age of twenty-four.

F.'s poems are distinguished by considerable humour, fancy, and purity of language, and he possessed great mastery over Lowland Scotch. He sketches with liveliness contemporary life and incidents, and much of our knowledge of old Edinburgh is derived from his verses. His fame however, rests quite as much upon his unhappy life and early death, and upon the circumstance that he was to some extent the forerunner of Burns, as upon the essential merits of his verse. Burns admired his works, was indebted to them for hints, called him 'his elder brother in the Muses,' and when he came to Edinburgh, erected a memorial-stone over his grave.

FE'RIÆ (Lat.), holidays during which political and legal transactions were suspended in ancient Rome, and slaves enjoyed a cessation from labour. Feriæ were thus *dies nefasti*, the opposite of the *dies fasti*. See FASTI. Days which were consecrated to a particular divinity, on which any public ceremony was celebrated, and the like, were feriæ. In contradistinction to these which were *feriæ publicæ* (public holidays), there were *feriæ privatæ*, which were observed by single families, in commemoration of some particular occurrence of importance to them or their ancestors. Birthdays, days of purification after a funeral, &c., were also observed as family feriæ. The public feriæ were divided into those which were always kept (*stativæ*) on certain days marked in the calendar; and those which were kept by command of the consuls or other superior magistrates on the occasion of any public emergency. 'The manner in which all public feriæ were kept bears great analogy to our Sunday. The people generally visited the temples of the gods, and offered up their prayers and sacrifices. The most serious and solemn seem to have been the *feriæ imperativæ;* all the others were generally attended by rejoicings and feasting.' See an elaborate article by Dr Schmitz in Smith's *Dictionary of Greek and Roman Antiquities.* In Scotland, those days during which it was not lawful for courts to be held, execution to proceed, or any other judicial step to be taken, used to be called *feriat* times, but the expression is obsolete.

FERMA'NAGH, an inland county in the south-west of Ulster province, Ireland. It is 45 miles long, and 29 broad. Area, 714 square miles, $\frac{3}{5}$ arable, $\frac{1}{76}$ in wood, and above $\frac{1}{9}$ in water, including Upper and Lower Lough Erne. There are other smaller lakes, as Loughs Melvin and Macnean. The surface is mostly a succession of abrupt mountains and hills, rising in Cuilcagh 2188 feet, and in Belmore 1312 feet. The scenery varies from the richest vales to the wildest uplands. The chief rocks are mountain limestone, with many cavities and underground water-courses, millstone grit, and old red sandstone. Some coal, iron, and marble occur. The chief rivers are the Erne and its tributaries, the Colebrooke, Woodford, and Arney. The soil in the low grounds is a deep rich loam, but in the limestone and sandstone districts, it is cold and thin. The climate is mild and moist. Marsh-fever prevails in summer and autumn in the low tracts near Lough Erne. In 1858, nearly half the surface was in crop; oats, barley, wheat, potatoes, turnips, and hay being the chief products. The chief exports are oats, butter, and eggs. F. is divided into 8 baronies and 23 parishes. It returns 2 members to parliament. Principal towns: Enniskillen, Lisnaskea, and Lowtherstown. Pop. (1851) 116,047; (1861) 105,372. In 1851, there were 130 national schools, with 8233 scholars. The chief antiquities are raths or rude hill-forts, and some ecclesiastical ruins.

FERMAT, PIERRE DE, a French mathematician, was born at Toulouse in 1590, and at an early period, in conjunction with his friend Pascal, hit upon a very ingenious mode of considering figurate numbers, upon which he subsequently based his doctrine of the calculation of probabilities. F. employed himself greatly with the properties of numbers, and made many acute discoveries in regard to their composition and analysis. He also squared the parabola in a much simpler way than Archimedes at an earlier period had done, and made many other discoveries in geometry. His method of finding the greatest and least ordinates of curved lines was analogous to the method of the then unknown differential calculus. In addition to his scientific attainments, F. possessed an extraordinary knowledge of ancient and modern languages. He died at Toulouse in 1665. A collection of F.'s works appeared at Paris in 1679.

FERMA'TA, in Music, is the name given to a pause, or resting-point, generally marked by the sign 𝄐. The notes over which this sign is placed are prolonged beyond their true length. The fermata is frequently found near the end of a part of a composition, which affords an opportunity for the singer or player to introduce an extempore embellishment.

FERMENTATION is the term applied to the change which occurs in one organic substance when influenced by another in a state of decay or putrefaction. The process was originally understood to include all the changes which matter of plant and animal origin undergoes when disunited from the living force, but is now restricted to certain of the changes. Thus, there are many substances, such as starch and sugar, which have no power of themselves to pass into decay, or change in composition through lengthened periods of time; whilst there is another class of substances, including albumen, fibrin, and caseine, as well as gelatinous tissues, mucus, &c., which, when exposed to moderately heated air in a moist condition, more or less rapidly begin to putrefy or decompose. The latter substances, viz., those which spontaneously pass into a state of change, are called *ferments*, and when they are brought in contact with sugar, &c., which otherwise would not be altered, they cause the latter to be broken up into simpler compounds; it is this process that constitutes fermentation. The ferment is always a body which has the power of rotting or becoming putrid, and is actually in a state of decomposition. Every substance which is liable to putrefy becomes, while putrefying, a ferment; and in this condition acquires the property of setting agoing the process of fermentation in any second body capable of it, and retains the power till it is so far decomposed that the putrescence is over. The ferments are very widely distributed in organic matter, and hence, whenever a plant or an animal dies, the process of fermentation proceeds more or less rapidly. The most important kind of fermentation is that known under the designation of *vinous*, and which forms part of the processes in the preparation of alcohol, beer, wine, &c. It consists in the action of a peculiar ferment called Yeast (q. v.) upon a saccharine liquid, when the sugar ($C_{12}H_{14}O_{14}$) is decomposed into two atoms of alcohol (each $C_4H_6O_2$), four atoms of carbonic acid (each CO_2), and two atoms of water (each HO). In this change it will be observed that the yeast, whilst it causes the change, does not unite directly or indirectly with any of the constituents of the sugar. The vinous fermentation proceeds best at a temperature ranging from 60° to 80° F., the mean and more desirable being about 70° F. The process itself causes the development of heat, and recourse must be had, therefore, to large airy rooms, where the fermenting tuns or vessels are arranged, and also to the circulation of cold water in pipes distributed round the interior of the vessels, and in contact with the liquid. See BEER.

The *lactic acid* fermentation takes place in milk when it begins to sour. The caseine of the milk acts the part of the ferment, and it causes the change in the sugar of milk, which is in part resolved into lactic acid ($C_6H_5O_5 + HO$). The latter then curdles the caseine, and the milk becomes clotted. When the milk still further sours, and the material is kept at a temperature of 77° to 86° F., the *butyric acid* fermentation takes place, in which the putrefying caseine changes the Sugar (q. v.) of milk into butyric acid ($C_8H_7O_3 + HO$).

The *viscous* or *mucus* fermentation occurs when the juice of the beet-root, dandelion, ash-tree, &c., is allowed to decompose at a temperature of 90° to 100° F., when the albuminous matter present causes the sugar to ferment into lactic acid, mannite, a gummy substance, some alcohol, and various gases. The same kind of fermentation occurs when boiled yeast or boiled gluten is added to ordinary sugar.

The remaining processes of fermentation are the *benzoic* fermentation, yielding, amongst other matters, the Essential Oil of Bitter Almonds (q. v.); the *sinapic* fermentation, which occurs in mustard when moistened with water, and during which the pungent oil of mustard is developed; and the *acetous* fermentation, which is, however, not a true instance of fermentation, as the oxygen of the air is required to complete the change. See ACETIC ACID.

FERMENTED LIQUORS are alcoholic beverages made by fermentation of saccharine fluids and juices; the principal being the different kinds of *ale* or *beer*, made by fermentation of an infusion of malt, chiefly of barley, but also sometimes of other kinds of grain; and *wine*, made by fermentation of grape-juice. *Cider* is made by fermentation of the juice of apples; *perry*, of that of pears; *palm-wine*, by fermentation of the sap of different kinds of palm. Fermented liquors, commonly called wines, are also made from the juice of various kinds of fruit, as currant wine from that of the red currant; and from the juice of some roots, as parsnip wine from that of the parsnip, &c. The sap of the American Aloe, or *Agave* (q. v.), yields the fermented liquor called *Pulque*, much used in Mexico. A wine is made from the sap of the birch, and that of some other trees is used for a similar purpose. *Mead* is a fermented liquor made from honey. From every fermented liquor, a kind of *spirit* may be obtained by distillation.

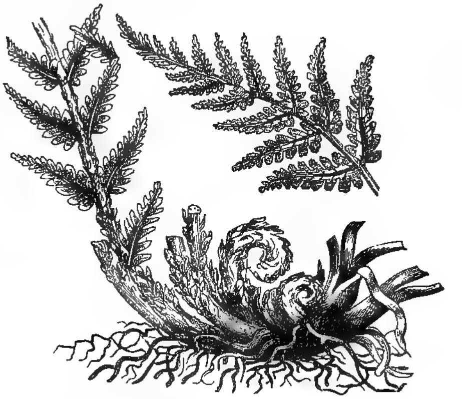
FERMENTED AND DISTILLED LIQUORS, STATISTICS OF. Under the headings BEER, SPIRITS, and WINE, will be found particulars as to the history, manufacture, &c., of these liquors. All that is contemplated in the present article, is a statement of the quantities manufactured and consumed in the United Kingdom of Great Britain and Ireland. In 1801, the consumption of spirits, British, colonial, and foreign, in the United Kingdom was 8,800,840 gallons. In fifty years, it had considerably more than trebled, having risen in 1851 to 28,760,224 gallons. In the same time, the population had risen from 15,506,794 to 27,452,262. In the former period, therefore, the consumption was at the rate of little more than half a gallon per head, while in the latter period it amounted to more than a gallon. There would seem, however, to have been something exceptional in the year 1801 to reduce the consumption to the low point we have mentioned, as in the previous year, the consumption was nearly 12 million gallons, and in the succeeding year, more than 15½ million gallons; and in no year during the half century did it fall so low as in 1801. The consumption at the two periods was divided over the three countries as follows: England, 1801, 6,150,983 gallons—namely, 2,555,920 British; 1,687,839 colonial; and 1,907,224 foreign. In 1851, 13,916,313 gallons—namely, 9,595,368 British; 2,542,395 colonial; and 1,778,550 foreign. In the former period, the consumption of each individual was less than three-fourths of a gallon; in the latter, nearly seven-ninths of a gallon. Scotland, 1801, 930,490—namely, British, 295,931; colonial, 349,237; and foreign, 285,322. 1851, 7,090,894—namely, British, 6,830,710; colonial, 179,883; and foreign, 80,301. The consumption per head in Scotland in 1801 was thus only three-fifths of a gallon, while in 1851 it was 2⅖ gallons. Ireland, 1801, 1,719,367—namely, British, 355,106; colonial, 1,057,316; foreign, 306,945. 1851, 7,753,017—namely, British, 7,550,518; colonial, 158,147; foreign, 44,352. In the former period, the consumption per head was two-thirds of a gallon; in the latter, about 1⅕ gallon. But there is every reason to believe, that the consumption in 1801 was much larger in the United Kingdom generally than the statistics indicate. Between the periods we have mentioned, the duty on British spirits varied considerably. In England, in 1802, it was 5*s.* 4¼*d.* per gallon; in 1819, it had risen to 11*s.* 8¼*d.*; and in 1851, it stood at 7*s.* 10*d.* In Scotland, in 1802, the duty was 3*s.* 10½*d.* per gallon; it rose to 9*s.* 4½*d.* in 1815; and in 1851, was 3*s.* 8*d.* In Ireland, in 1802, it was 2*s.* 10¼*d.*; in 1815, it had risen to 6*s.* 1½*d.*; in 1851, it stood at 2*s.* 8*d.* The duties in the three countries have now been equalised, the sum fixed being at first 8*s.* per gallon, since raised to 10*s.*, at which it now (1862) remains. The total number of gallons of proof-spirits distilled in the United Kingdom in 1860 was 28,289,731—namely, in England, 7,868,525; in Scotland, 13,946,536; Ireland, 6,474,670. The number of gallons on which duty was paid in the United Kingdom in 1860 was 21,873,384, the duty amounting to £9,702,807. Of this sum, £4,493,212 was paid in England on 10,108,522 gallons; £2,863,811, in Scotland on 6,428,549 gallons; £2,345,783 in Ireland on 5,336,313 gallons. Of the whisky distilled in Scotland in 1860, 4,621,283 gallons were exported into England, and 771,637 gallons into Ireland; Scotland receiving in return from England 7852 gallons, and from Ireland 4904 gallons. Ireland sent to England 1,087,347 gallons, and got back in return 72,228 gallons. Of foreign spirits, there were imported into the United Kingdom in 1860, rum, 7,353,114 gallons, of which 3,729,419 were entered for home consumption; brandy, 2,342,540 gallons, 1,463,636 being for home consumption; and Geneva, 635,408 gallons, 261,208 for home consumption. The quantity of wine entered for consumption in 1802 was 5,449,710 gallons, upon which a duty of £1,723,339 was paid; in 1851, 6,280,653 gallons were entered for consumption, and a duty of £1,776,246 was levied thereupon. In 1860, 12,483,362 gallons were imported, chiefly from Spain, Portugal, and France, of which 7,358,192 were retained for home consumption, 4,356,779 being white wine, and the rest red.

The quantity of beer manufactured in Great Britain and Ireland can only be arrived at approximately, the duty being leviable on the malt, and not on the liquid made from it. The general estimate, however, is, that two bushels of malt produce one barrel, or 36 gallons of beer. In 1860, the quantity of malt brewed in the United Kingdom was 40,606,552 bushels, equal to 20,303,276 barrels, or 730,917,936 gallons of beer. This beer was made chiefly in England, 36,697,131 bushels of malt being consumed there; in Scotland, the quantity used was 1,629,448 bushels; and in Ireland, 2,279,973 bushels.

FE'RMO, a town of Italy, capital of the delegation of the same name, is situated on a rocky height 4 miles from the Adriatic, and 32 miles south-south-east of Ancona. It is well-built and fortified, surrounded with walls and ditches, is the seat of an archbishop, and has a cathedral, a university (not, however, of any importance), and an elegant theatre. It has some trade in corn and wool. Pop. 9130. In the immediate vicinity are the ruins of the ancient Firmum, whose name F. inherits. Firmum had been a Roman colony from the year 264 B.C.

FERMOY, a town in the east of Cork county, Ireland, chiefly on the right bank of the Blackwater, 19 miles north-east of Cork city. Its origin dates from the 12th c., when it was the seat of a great Cistercian abbey; but its present importance, which commenced in the end of last century, is due to Mr (afterwards Sir John) Anderson, who introduced mail-coaches into Munster. The hills to the south of the town rise in Knockinskeagh 1388 feet. F. is handsomely built and regularly laid out. A large ecclesiastical establishment (Roman Catholic), consisting of a church, a bishop's house, two convents with large schools, and a college with nearly 100 students, has recently been erected on a hill rising from the Blackwater. A bridge of 13 arches, built in 1689, crosses the river. Infantry and cavalry barracks for 3000 men crown the heights on the left bank of the river, and command one of the chief approaches to Cork. F. has a trade in agricultural produce. Pop. (1861) 6202, of whom about 5000 are Catholics.

FERN, MALE, a name given, in consequence of an erroneous notion, long since exploded, to a fern very common in the woods of Britain and of the continent of Europe, the *Aspidium filix mas* of some botanists, and *Lastræa filix mas* and *Nephrodium filix mas* of others. The fronds are bipinnate; the pinnules oblong, obtuse, and serrated; the sori near the central nerve, orbicular, kidney-shaped, and fixed by the sinus; the stipes and rachis chaffy. If not one of the very finest of our ferns, it is certainly a chief ornament of many of our woods, and a plant of very considerable beauty. The subterranean stem (rhizome) is officinal. It is about a foot long, and of the thickness of a quill, almost inodorous, with a nauseous sweet taste, becoming astringent and bitter. It was anciently used as an anthelmintic, and its use has been revived, especially in cases of tapeworm, in which it is believed to be very efficacious. Its anthelmintic powers are due to a thick, almost black volatile oil which it contains, and which is now itself also used in medicine.



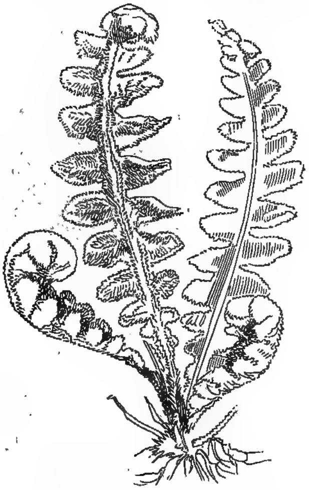
Common Male Fern.

FERN, SWEET (*Comptonia asplenifolia*), a shrub of the natural order *Amentaceæ*, sub-order *Myriceæ*, a native of the mountain-woods of North America, forming a small bush with linear pinnatifid, fern-like leaves. Its leaves have a powerful aromatic fragrance when rubbed. It is tonic and astringent, and is much used in the United States as a domestic remedy for diarrhœa.

FERNA'NDO PO, an island on the west coast of Africa, in the Bight of Biafra, is situated about 20 miles from the nearest point on the shore, and is about 44 miles long and 20 miles broad. The appearance of this island from the sea is exceedingly picturesque and beautiful. It is traversed by a mountain-ridge, which, in Clarence Peak, rises to the height of 10,650 feet, and is fertile, well-watered, and in many parts thickly wooded. Besides swarms of monkeys, some of which are of great size, the island contains many goats and sheep in a state of nature. The climate, always excessively hot, is rendered more intolerable, during the rainy season, by a pestilential wind from the continent. The native population, who are of negro race, are said to amount to from 10,000 to 12,000 in number, and to inhabit fifteen villages. The English, with the consent of Spain, into whose hands F. P. had fallen, made an attempt in 1827 to form a settlement on the island, but abandoned it in 1834. In 1844, it was again taken possession of by Spain. The colony has a population of about 900, most of whom are liberated Africans.

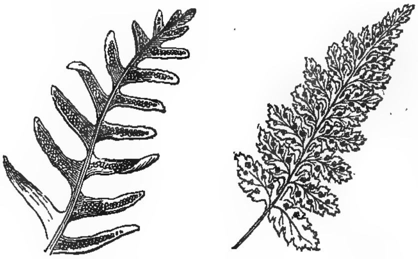
FERNAN-NUNEZ, a small town of Spain, in the province of Cordova, and 10 miles south of the town of that name. It has some linen and woollen manufactures. Pop. 5500.

FERNS (*Filices*), an order of acrogenous or cryptogamous plants, divided by some botanists into several orders; whilst some make *Filices* a sub-class, and include in it *Lycopodiaceæ*, *Marsileaceæ*, and *Equisetaceæ*. See these heads. F. are either herbaceous perennial plants, or more rarely trees, the root-stock or the stem producing leaf-like *fronds* (often called leaves), which are sometimes simple, sometimes pinnated, or otherwise compound, exhibit great variety of form, and are generally coiled up (*circinate*) in bud (see accompanying illustration).



Ceterach Officinarum.

The fronds are traversed by veins, generally of uniform thickness, which are simple or forked, or netted, sometimes produced from the sides of a midrib or primary vein, sometimes from a primary vein on one side, sometimes radiating from the base of a frond or segment of a frond. The fructification takes place either on the lower surface or on the margin of the fronds, and arises from the veins. The spores are contained in capsules or spore-cases (*thecæ*, *sporangia*), which are often surrounded with an elastic ring, and are either naked or covered with a membrane (*involucre* or *indusium*), and are generally clustered in round or elongated or kidney-shaped masses (*sori*). The margin of the frond is sometimes folded so as to cover the spore-cases, and sometimes, as in the Flowering Fern (*Osmunda*) (q. v.), the fertile part of the frond is so transformed that its leaf-like character entirely disappears, and it becomes a spike or panicle. The spore-cases burst at their circumference, or longitudinally, or irregularly. Moving spiral filaments exist in F., but their functions in connection with reproduction are not well known.



Ferns:
Shewing the Sori on the back of the Fronds.

The reproduction of F. has been the subject of much investigation and discussion, and supposed discoveries of sexual organs have been announced, but satisfactory evidence of their nature has not been obtained.—The number of known species of F. is about 2500. They are found in all parts of the world, but are fewer towards the poles than within the tropics, and fewer in continental than in maritime countries, abounding exceedingly in mountainous tropical islands, as in Jamaica. Many of them delight in moisture and shade, although some are found in the most exposed situations. Some of them resemble mosses in size and appearance; whilst Tree Ferns (q. v.) resemble palms, and sometimes attain a height of forty feet. A few are climbers. One climbing species (*Lygodium palmatum*) is found in North America as far north as Boston.—F. are divided into *Polypodieæ*, *Hymenophylleæ*, *Gleichenieæ*, *Schizæeæ*, *Osmundeæ*, *Danæeæ*, and *Ophioglosseæ*, of which sub-orders (or orders) the first, second, fifth, and seventh alone contain British species, and the first contains a great majority of all ferns.—The root-stocks of some F. contain so much starch that they are either used as food, or food is prepared from them, particularly those of the Tara (q. v.) Fern in New Zealand and Van Diemen's Land, and those of *Aspidium* (or *Nephrodium*) *esculentum* in Sikkim and Nepal; also the stems of some of the tree-ferns, as of *Cyathea medullaris* in New Zealand, and *Alsophila spinulosa* in India. The young and tender fronds of some F. are occasionally used as pot-herbs in the Highlands of Scotland, Norway, the Himalaya, &c. The fronds are generally mucilaginous, slightly aromatic and astringent. Those of some species of Maidenhair (q. v.) are used for making *capillaire*; whilst the bitter and astringent root-stocks of some F. are occasionally used in medicine, as those of the Male Fern (see Fern, Male) and the Peruvian *Polypodium Caliguala*, particularly as anthelmintics. The fronds of a few species are delightfully fragrant.—The cultivation of F. is now in many places successfully conducted on a somewhat extensive scale, both in the open air and in hothouses; and to such an extent has the occupation of fern-collecting reached, that many excellent treatises on this subject alone have been written and elaborately illustrated. Amongst others, we may mention *British Ferns* (1s.), published by Routledge, London, as an excellent handbook; while the magnificent Nature-printed work, published in 2 volumes, royal 8vo, by Bradbury and Evans, supplies all needful information. Wardian cases, filled with them, have also become common, and are most pleasing ornaments of apartments. The principal species will be noticed under their particular heads.

FERO'ZÉ PORE (so called from its founder, Feroze Toghluk, who reigned in Delhi from 1351 to 1388) stands about 3 miles from the left or south-east bank of the Sutlej, in lat. 30° 55′ N., and long. 74° 35′ E. At one time, a large and important town, as its massive fortifications and extensive ruins still indicate, it had sunk into poverty and insignificance, before it actually came, in 1835, into the possession of the English. Since then, the place has regained much of its former consequence, holding out, with its wide streets and its colonnaded bazars, the promise of a grand emporium of commerce. Politically, too, F. P. has become prominent under British supremacy, having been a starting-point, whether for war or for negotiation, in many of our dealings with Afghanistan and the Punjab. In connection with this feature in its history, the city contains a monumental church in honour of the memory of those, both privates and officers, who fell in the various conflicts with the Sikhs. The population is about 10,000.—The *district* of the same name has an estimated area of 200 square miles, and a population of 20,000. It is now for the most part either barren or covered with jungle, but the ruins of towns and villages indicate that it must have been at one time both more fertile and more populous.

FERO'ZÉ SHAH, a village apparently within the district of Feroze Pore, and situated about 10 miles east-south-east of the town of that name, is in lat. 30° 52′ N., and long. 74° 50′ E., lying about 12 miles from the left bank of the Sutlej. It claims notice mainly as the scene of the second in order of the four great battles of the first Sikh war. The conflict in question, which lasted two days, took place in December 1845, ending in the rout of the natives and the capture of their intrenchments. The British army was commanded by Sir Hugh Gough and Sir Henry Hardinge; and, as in the victory of Moodkee, gained only three days before, it sustained heavy loss.

FEROZE SHAH CANAL, a work, including its branches, of 240 miles in length, demands detailed notice as well for its historical interest as for its economical value. It dates back as far as 1356, owing its origin, as well as its name, to Feroze Toghluk, king of Delhi. Viewed as a whole, it leaves the right bank of the Jumna in lat. 30° 19′ N.; and, after sweeping round so as to skirt Sirhind, a territory on the Sutlej, it rejoins its parent stream at Delhi in lat. 28° 39′, thus measuring, in mere difference of latitude, 100 geographical miles. This artificial water-course, intended principally for the purposes of irrigation, seems to be equally creditable to native enterprise and native skill. But, as nothing of the kind appears to be permanent in the East, this noble channel was so much neglected, that, in the beginning of the 17th c., it was cleared out by Vizier Ali Murdan Khan, who, in point of fact, was the first to carry it, through its lower half, back into the Jumna. Finally, the entire line has, during this 19th c., been again repaired and improved by the British government. In the light of the drought and famine of 1860, the importance of such undertakings as the Feroze Shah Canal can scarcely be overrated.

FERRANDI'NA, a town in the south of Italy, in the province of Basilicata, stands on a height on the right bank of the Basento, 35 miles east-south-east of Potenza. Good wine is produced in the neighbourhood. Pop. about 6000.

FERRA'RA, the most northern of the Italian provinces that are washed by the Adriatic. It extends immediately south of the Po, between the main branch of which, and the Po di Primaro, it is for the most part enclosed. As one of the old delegations, it had an area of 1180 square miles, with a population amounting to 244,524; but according to the official *Statistica Administrativa del Regno d'Italia*, published at Turin in 1861, the province had undergone certain modifications, and its population in 1861 stood at 194,161. The area consists, for the most part, of swamp and lake; and many rivers and canals intersect it. Between the Po di Volano and the Po di Primaro, the marshes become very extensive, and receive the name of *Valli di Comaccio*. This province produces great quantities of fish, affords good pastures, and carries on a great trade in corn and hemp. It was at one time a dukedom under the House of Este, but on the failure of a legitimate male heir, Pope Clement VIII. wrested it from this family, and annexed it to the States of the Church in 1598. It became part of the kingdom of Italy in 1860.

FERRA'RA, an ancient city of Italy, capital of the province of the same name, is situated in a low marshy plain in the delta of the Po, and about 4 miles south of the main branch of that river, 28 miles north-north-east of Bologna, and 40 miles north-west of Ravenna. F. was first made a walled city by the exarch of Ravenna about the close of the 6th c., and in the following century (661 A.D.) became the seat of a bishop. In the middle ages, it was the great commercial emporium of Italy, and the seat of a court renowned throughout Europe; but now the city has a peculiarly deserted and melancholy appearance; grass grows on the pavements of its broad and regular streets, and its churches and palaces are either rapidly falling, or have already fallen into decay. It is surrounded with walls, and is strengthened by bastions and a fortress. The old castle, or ducal palace, once the residence of the Dukes of Este, but recently, until 1860, occupied by the papal legates, rises like a huge rock, is strengthened with corner-towers, and surrounded by a ditch. Its ecclesiastical edifices, which are very numerous, and of which the churches of Santa Maria degl' Angeli and of San Benedetto are the most remarkable in point of architecture, are rich in paintings by the great masters of the Ferrara and Bologna schools. Besides their valuable paintings, these churches contain numerous sculptured monuments of famous persons; the church of San Francesco has a curious echo, with sixteen reverberations. The university, founded in 1264, was reorganised in 1402, closed in 1794, and reopened in 1824. It is in high repute as a school of medicine and jurisprudence, and is attended by about 200 or 300 students. It has an excellent library, which, besides a variety of MSS., missal paintings, and old editions of printed works, contains several of the works of Tasso and Ariosto in their own hand. F. is specially remarkable for its art associations. Under the patronage of the Dukes of Este, it produced a school of painters who rank high in the history of art; while in literature the name of F. is immortalised through its connection with those of Tasso, Ariosto, and Guarini. At the period of its greatest prosperity, F. had about 100,000 inhabitants, but at present it has a population of only 30,928.

In 1849, the Austrians took possession of the town, but were compelled to abandon it at the commencement of the Italian campaign in June 1859. In April 1860, F., with the state of which it is capital, was formally annexed to the kingdom of Italy under Victor Emanuel.

FERRA'RI, GAUDENZIO, sprung from a family which followed a career of art as if by inheritance, was born at Valdugia, in the Milanese, in 1484.

A scholar of Andrea Scotto and Perugino, and the chosen associate and friend of Raphael, his own creations may be said to have caught some inspiration from each of these three great masters, while they also unmistakably reflect genius of a bold, unshackled originality. The chief characteristics of F.'s style are correct and vigorous delineation, extreme vividness and delicacy of colouring, noble grace of form and attitude, and unsurpassable art in the classic disposal of drapery. Being one of the most laborious artists of his day, he has executed innumerable paintings both in *fresco* and in oil, the greater part of which are possessed by the Lombard galleries. His most comprehensive work, the frescos at Barallo, in Piedmont, represents the Passion; the 'Martyrdom of St Catherine,' to which he owes his brightest fame, is in the Milanese collection of paintings. He died in 1549, having formed some good scholars, the chief of whom is Andrea Solario.

FE'RRATES are combinations of ferric acid (FeO_3), a weak unstable compound of iron and oxygen with bases. See Iron.

FERREI'RA, Antonio, one of the classic poets of Portugal, was born at Lisbon, 1528. He was educated at Coimbra, where he occupied himself with the study of the Italian and Latin authors, more especially Horace, whom he almost rivalled in conciseness, but not in elegance of expression. After holding for some time the office of a professor at Coimbra, he obtained a civil appointment of some importance at the court of Lisbon. He carried to perfection the elegiac and epistolary styles, already attempted with success by Sâ de Miranda, and transplanted into Portuguese literature the epithalamium, the epigram, ode, and tragedy. His *Ines de Castro* is the second regular tragedy that appeared after the revival of letters in Europe, the first being the *Sophonisba* of Trissino. It is still regarded by the Portuguese as one of the finest monuments of their literature, for its sublime pathos and the perfection of its style. The works of F. are not numerous, as his official duties left him little leisure. He died 1569. All his works are distinguished by soundness and depth of thought. His expression is strong rather than sweet, is extremely animated, and full of that fire which elevates the mind and warms the heart. His efforts after brevity, however, frequently led him to sacrifice harmony to thought. His *Poemas Lusitanos* were first published at Lisbon, 1598, and the *Todas as obras de Ferreira* in 1771. Compare Sismondi's work, *La Littérature du Midi* (Paris, 1813), and Bouterwek's *Geschichte der neuern Poesie und Beredsamkeit* (12 vols. Gött. 1801—1819).

FE'RRET (*Mustela furo*), an animal of the weasel family (*Mustelidæ*), so nearly allied to the Polecat (q. v.), that many regard it as a mere domesticated variety. It is of rather smaller size, the head and body being about fourteen inches long, the tail five inches and a half, the muzzle rather longer and more pointed, the head rather narrower; and the colour is very different, being yellowish, with more or less of white in some parts, there being two kinds of hair, the longer partly white, the shorter yellow. The eyes are pink. It is, however, much more susceptible of cold than the polecat, and requires careful protection from it in climates where the polecat is a hardy native. It was imported into Europe from Africa, and was well known to the Romans, being anciently employed, as it still is, in catching rabbits, for which purpose it is often sent into their burrows muzzled, or 'coped,' by means of a piece of string, to drive them out into nets, or, with a string attached to it, it is allowed to seize a rabbit in the burrows, and is then drawn out, holding it fast. The usual plan, however, is to let the F. have free range of rabbit-holes unmuzzled. Ferrets are generally kept in boxes, and attention to warmth and cleanliness is essential to their health. They are capable only of partial domestication, acquiring a kind of familiarity with man, and submitting with perfect quietness to his handling, but apparently never forming any very decided attachment; and they never cease to be dangerous if not carefully watched, especially where infants are within their reach. If allowed any measure of freedom, they are ready to attack poultry, and kill far more than they can devour, merely sucking the blood. They generally breed twice a year, each brood consisting of six or nine. The female sometimes devours the young ones, in which case another brood is speedily produced.

Ferret (*Mustela furo*).

FE'RRIDCYA'NOGEN is a compound organic radical which has not been isolated, but which forms with potassium a well-known compound used in the arts, called the ferridcyanide of potassium or red prussiate of potash. In the preparation of this salt, a solution of ferrocyanide of potassium is acted on by a stream of chlorine gas until the colour of the liquid passes from yellow to deep red, and thereafter, on evaporation and cooling, fine red crystals are obtained. The chlorine (Cl) acts upon two equivalents of the ferrocyanide of potassium (twice $2K,FeC_6N_3 = 4K,Fe_2C_{12}N_6$), removing one equivalent of potassium (K), forming chloride of potassium (KCl), whilst the remaining constituents combine together, and produce one equivalent of ferridcyanide of potassium ($3K,Fe_2C_{12}N_6$, or $3K,Fe_2Cy_6$, or 3K,Fdcy). The latter is known commercially in red crystals, readily soluble in water, and yields a fine deep *Prussian blue* (Turnbull's blue) when mingled with solution of protosulphate of iron (green vitriol), and hence is used largely in dyeing and calico-printing.

FERRIER, James F., LL.D., a metaphysician, was born in Edinburgh, November 1808. After studying at Oxford, where he took the degree of B.A. in 1832, he was admitted to the Scottish bar in 1833. In 1842, he was elected to the chair of History in the university of Edinburgh, and in 1845 to that of Moral Philosophy in the university of St Andrews. Mr F. early attracted notice by some metaphysical essays, which appeared in *Blackwood's Magazine;* and in 1854 he published the *Institutes of Metaphysics*, in which he endeavours to construct a system of idealism in a series of propositions, demonstrated after the manner of Euclid. He has lately edited the collected works of his father-in-law, the late Professor John Wilson of the University of Edinburgh.

FERRIER, Susan Edmonston, aunt of the former, a successful novelist, was born in Edinburgh in 1782, and died in 1854. Her father, James Ferrier, one of the principal clerks of the Court of Session, and the colleague in that office of Sir Walter Scott, lived on terms of intimacy with the wits and literati of his day in Edinburgh, and Miss F.'s talents and quick powers of observation were early called into play in the midst of the literary society in which her youth was passed. Her first work, *Marriage*, appeared in 1818, and this was followed by *The Inheritance* (1824), and *Destiny* (1831). The merit of these tales, which are characterised by genial wit, a quick sense of the ludicrous, and considerable ability in the delineation of national peculiarities, is sufficiently proved by the fact, that they have stood their ground, notwithstanding the enormous number of works of fiction which have flowed from the press since their publication. Miss F. enjoyed the esteem and friendship of Sir Walter Scott, who, in the days of his strength, repeatedly gave expression to his appreciation of her talents, and who derived consolation from her sympathy in the season of gloom which darkened the close of his life.

FE'RRO, or **HIE'RRO**, the most western of the Canary Isles, was formerly considered the most westerly point of the Old World, and for this reason geographers at one time took it as the point of departure in reckoning longitudes, as is still done by the Germans and others. Hence, in all probability, originated the present hemispherical division of the maps of the world, F. being taken as the boundary-line. The English, however, have adopted the meridian of Greenwich as the first meridian and in this their example is followed by the Dutch, and in sea-charts generally; area, 82 square miles; pop. 4400. The meridian of F. is 18° 9′ west of that of Greenwich. See Longitude.

FE'RROCYA'NOGEN is a compound organic radical, generally regarded by chemists as existing in ferrocyanide of potassium, or the yellow prussiate of potash, but which has not yet been obtained in a separate state. The principal compound of ferrocyanogen is the ferrocyanide of potassium, which is prepared by heating to redness in a covered iron pot a mixture of 3 parts by weight of nitrogenised matter, such as dried blood, hoofs, parings of hides, scrapings of horn, or the flesh of old or diseased horses and other animals, 3 parts of carbonate of potash, and one part of iron filings. The carbon, nitrogen, and iron combine together, and form ferrocyanogen ($FeC_6N_3 = FeCy_3$, or Cfy), which, at the same time, unites with the potassium, and produces ferrocyanide of potassium, or yellow prussiate of potash (2K,Cfy). The compound which is obtained from the heated iron vessel is impure, but by repeated solutions in hot water, and recrystallisation on cooling, the salt is obtained pure in fine large tabular crystals of a lemon-yellow colour. The ferrocyanide of potassium is largely used in dyeing and Calico-printing (q. v.) in the production of many shades of *Prussian blue;* and when it is treated with sulphuric acid, and subjected to heat applied, hydrocyanic or prussic acid ($HC_2N = HCy$) distils off from the mixture. The ferrocyanide of potassium is characterised by giving no indication of the presence of iron in its radical on the application of any of the tests for iron. It gives a light-blue precipitate on the addition of a solution of proto-sulphate of iron; a dark blue precipitate with perchloride of iron; a ruddy brown precipitate with sulphate of copper; and a white precipitate with acetate of lead.

FE'RROL, a strongly fortified seaport town of Spain, in Galicia, is most advantageously situated on a narrow arm of the sea, 14 miles north-east of the town of Corunna. It was originally a fishing-town, until selected for its natural advantages as a seaport by Charles III., who erected here what was at one time the finest naval arsenal in the world, and destined it exclusively for the Spanish royal navy. The entrance to the harbour, formed by a narrow inlet from the Bay of Betanzos, admits of the approach of only one ship-of-the-line at a time, and is defended by the castles of San Felipe and Palma. The town is defended by walls and fortifications, is, on the whole, regularly built, and has several squares and pleasing alamedas or public walks. The arsenal, in which fifteen ships-of-the-line could be simultaneously built, covers a great space; and though now in a somewhat ruinous condition, is still the most important in Spain. F. has manufactures of hats, naval stores, hardwares; and exports corn, brandy, vinegar, and fish. Pop. (including the garrison) 16,640.

FE'RROTYPE, a term applied by Mr Robert Hunt, the discoverer, to designate some photographic processes, in which salts of iron play an important part. Like many of the earlier paper processes, the ferrotype is far inferior in sensibility to the more modern collodion process or Archerotype, and is on that account seldom if ever used even for landscapes.

FERRU'GINOUS is a term employed in chemistry to denote the presence of iron in natural waters, minerals, &c. It is synonymous with the term chalybeate. See Chalybeate Waters.

FERRY (from Sax. *faran*, Ger. *fahren*, to move, proceed, allied to the Lat. *fero*, Eng. *bear*), a passage by boat across water. By the law of England, a man may have a right to keep a boat and to ferry passengers for a consideration, just as he may have a right to hold a fair, either by royal grant, or by prescription, from which a royal grant at some previous time will be presumed. No other title, unless conferred by act of parliament, will suffice, for no fair, market, or ferry can be set up without licence from the crown either actual or presumed. The possessor of such a title need not necessarily be the proprietor of the soil on which the market is held, or of the water over which the right of ferry is exercised. In the latter case, he need not be the proprietor of the soil on either side of the river, though he must possess such rights over it as will enable him to embark and disembark his passengers. As fulfilling his part of the bargain with the public, the owner of a ferry is bound to keep a boat fit for the purpose of carrying passengers, whilst on the other hand he has a right of action not only against those who refuse or evade payment of the toll or passage money, but against those who disturb his franchise by setting up a new ferry so near as to diminish his custom.—Stephen, i. pp. 663, 664. It has been more than once decided, that the erection of a second ferry in such circumstances is a nuisance to the owner of the old one, who is bound to keep his ferry in readiness for the use of the Queen's subjects, a burden which is not shared by his rival (North and South Shields Ferry Co. *v.* Barker, 2 Exch. 136). The rule in Scotland as to rival ferries is the same; but a grant of ferry from the crown to one heritor does not prevent his neighbours from keeping private boats for the transport of themselves and their families and servants. Where ferries have not been given out by royal gift, either express or presumed as above described, they are *inter regalia*, i. e., they belong to the crown for the public benefit. In this case, they are under the management of the trustees of the roads connected with them, or are regulated by the justices of the peace for the county, or by special acts of parliament. By 8 and 9 Vict. c. 41, certain rules are laid down for the regulation of ferries. The act is confined to Scotland.

Common rowing-boats are generally used for ferrying foot-passengers, but when horses and carriages have to be taken across, a flat-bottomed barge, with an inclined plane at one end, to rest upon the shore, for landing and embarking, is generally used. This is either rowed across or pulled by a rope. When the current is strong, and the river of moderate width, the latter is best. The rope stretched across the river passes through rings or over pulleys attached to the barge, and the ferrymen move the barge across by pulling the rope. The chief advantage of the rope is to restrain the barge from drifting in the direction of the stream. With a small boat, this is obviated by the ferryman rowing obliquely, as though he were steering for a point higher up the river; thus he moves through the water upwards to the same extent that the water moves over the land downwards; and by a composition of these motions, and his tending to the other side, he is carried directly across. Broad estuaries are now traversed in many places by steam-ferry.

Rafts are sometimes used for ferrying. On the Nile, a sort of raft is made of inverted earthen-pots full of air. For further information on the crossing of rivers, see FORDS AND FORDING.

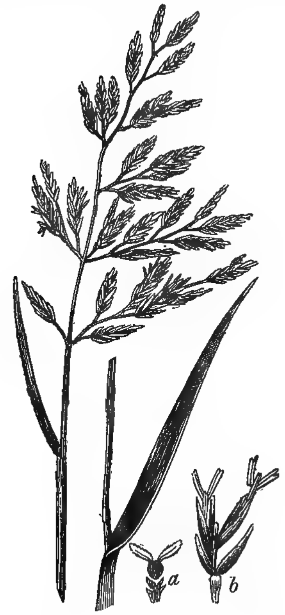
Flying-bridge is the name given to a kind of ferry-boat which is moved across a river by the action of the combined forces of the stream and the resistance of a long rope or chain made fast to a fixed buoy in the middle of the river. The boat thus attached is made to take an oblique position by means of the rudder; the stream then acting against the side, tends to move it in a direction at right angles to its length, while the rope exerts a force in the direction towards the buoy. If these two forces be represented by the sides of a parallelogram, the actual course of the boat would be in the direction of the diagonal (see COMPOSITION AND RESOLUTION OF FORCES); but as the length of the rope remains the same, the boat must continue always at the same distance from the buoy, and therefore its course is a curve, a portion of a circle, of which the buoy is the centre, and the rope the radius. The course of the boat and the action of the two forces are strictly analogous to the path of a rising kite, and to the forces of which this path is the resultant. The holder of the kite corresponds to the buoy, the wind to the tidal stream, and the tail to the rudder. Flying-bridges are used for military purposes, and the modes of adapting them to the varying circumstances of the width of rivers and the velocity of their currents, forms a part of the study of military engineering. An important element in the problem, is the determination of the right point of attachment for the rope. In the case of a wide river, the rope or chain requires to be of considerable length, and must be supported by movable buoys or by small boats.

FERTILISA'TION OF PLANTS. See FECUNDATION.

FESA, or **FASA**, a town of Persia, in the province of Fars, 80 miles south-east of Shiraz, is situated in a mountain defile, is of considerable size, and is said to have a population of 18,000. It has manufactures of silken, woollen, and cotton fabrics, and some trade in a superior kind of tobacco which is grown in the vicinity.

FE'SCENNINE VERSES, a branch of the indigenous poetry of ancient Italy, were a sort of dialogues in rude extempore verses, generally in Saturnian measure, in which the parties rallied and ridiculed one another. It formed a favourite amusement of the country-people on festive occasions, especially at the conclusion of harvest and at weddings. As was to be expected, it often degenerated into licentiousness, that at last required the curb of the law. The Fescennine verses are usually considered to be of Etruscan origin, and to have derived their name from the Etrurian town Fescennium; but there is little probability in this etymology. Verses of this sort were and are popular to this day all over Italy. The name is more likely connected with *fascinum*, fascination, enchantment, or the evil eye, against which the chanting of verses may have originally been intended as a protection.

FESCUE (*Festuca*), a genus of grasses, very nearly allied to Brome-grass (q. v.), and having in some species a loose, in some a contracted panicle; the spikelets many-flowered, with two unequal glumes, which they much exceed in length; each floret having two lanceolate paleæ, the outer palea rounded at the back, and acuminate or awned at the summit; the stigmas growing from the apex of the germen. The species are numerous, and are very widely diffused over the world, both in the northern and southern hemispheres. Among them are many of the most valuable pasture and fodder grasses. None are more valuable than some of the British species.—MEADOW F. (*F. pratensis*), a species with spreading panicle and linear spikelets, from two to three feet high, common in moist meadows and pastures of rich soil, in Britain and throughout Europe, in Northern Asia, and in some parts of North America, is perhaps excelled by no meadow or pasture grass whatever. It is suitable both for



Fescue Grass (*Festuca pratensis*):
a, germen and stigmas; *b*, a spikelet.

alternate husbandry and for permanent pasture.—Spiked F. (*F. loliacea*)—by many botanists regarded as a variety of Meadow F., although it departs from the habit of the genus in having the branches of the panicle reduced to a single spikelet, and forming a two-rowed raceme or spike—is regarded as an excellent grass for rich moist meadows.—Hard F., (*F. duriuscula*), a grass from one foot and a half to two feet high, with a somewhat contracted panicle, mostly on one side, is one of the best grasses for lawns and sheep-pastures, particularly on dry or sandy soils. Several varieties are known to seedsmen and farmers.—Creeping F. or Red F. (*F. rubra*) is probably a mere variety of Hard F., being distinguished chiefly by its extensively creeping root, which particularly adapt it to sandy pastures, and to places liable to occasional inundations.—Sheep's F. (*F. ovina*) is a smaller grass than any of these, not generally exceeding a foot in height, and often much less, abundant in mountainous pastures, and especially suitable for such situations, in which it often forms a principal part of the food of sheep for many months of the year. It is common in all the mountainous parts of Europe, and in the Himalaya, it is also a native of North America, and species very similar, if not mere varieties, abound in the southern hemisphere. Its habit of growth is much tufted.—Tall F. (*F. elatior*) is a grass of very different appearance, four or five feet high, with spreading much branched panicle, growing chiefly near rivers and in moist low grounds, and yielding a great quantity of coarse herbage, which, however, is relished by cattle.—Of foreign species, which have been introduced into Britain, *F. heterophylla* best deserves notice, a tall species with narrow root-leaves, and broad leaves on the culm; a native of France and other parts of the continent of Europe, and pretty extensively cultivated in some countries, particularly the Netherlands.—All these species are perennial.—Some small annual species occasionally form a considerable part of the pasture in dry sandy soils, but are never sown by the farmer.—A Peruvian species (*F. quadridentata*), called *Pigouil* in its native country, and there used for thatch, is said to be poisonous to cattle.

FESS. The fess in heraldry consists of lines drawn horizontally across the shield, and containing the third part of it, between the honour point and the nombril. It is one of the honourable ordinaries, and is supposed to represent the waist-belt or girdle of honour, which was one of the insignia of knighthood.

Per Fess.—A shield, or charge in a shield, is said to be *party per fess*, when it is horizontally divided through the middle, or, as the French say, simply *coupé*.

Fesswise is said of a charge placed *in* fess; that is to say, horizontally across the shield.

FE'SSLER, Ignaz. Aurelius, a celebrated Hungarian historian, was born in 1756, in the county of Soprony or Oedenburg. During a long life full of adventures, F. served successively the Emperor Joseph II., the King of Prussia, and the Emperor of Russia; and also held the office of Professor of Oriental Languages at different universities. He died at St Petersburg 15th December 1839. Among his works of a lasting value are—*Attila* (Breslau, 1794), *Mathias Corvinus* (2 vols. 1793; 2d edition, 1806, Breslau), and the History of the Hungarians, &c. (*Geschichte der Ungern und deren Landsassen*, 10 vols., Leip. 1812—1825). His autobiography, entitled Recollections of my 70 Years' Pilgrimage (*Rückblicke auf meine* 70 *jährige Pilgerschaft*, Breslau, 1826; 2d edit. Leip. 1851), is also a very interesting work. Deep learning, coupled with a rare beauty of style, render F.'s works (all written in German) attractive in the highest degree.

FE'STIVAL PLAYS. See Moralities, Miracle Plays, Mysteries.

FE'STIVALS, or FEASTS (Lat. *festum*, probably from the same root as *fast* (q. v.); according to some, from Gr. *hestia*, hearth), a term denoting certain periodically recurring days and seasons set aside by a community for rest from the ordinary labour of life, and more or less hallowed by religious solemnities. Originating within the narrow circle of the family, and commemorating momentous events affecting one member or all, these pauses became more frequent, and of wider scope, as the house gradually expanded into a tribe, a people, a state. The real or imaginary founders, legislators, heroes, became objects of veneration and deification, and the salient epochs of their lives the consecrated epochs of the year. National calamities or triumphs were, in the absence of annals, best remembered by corresponding general days of humiliation or exultation. Earliest of all, however, did the marked stages in the onward march of nature: spring and autumn, seed-time and harvest-time—symbols of life and death; the solstices—turning-points of summer and winter; the new moon and the full moon; the termination of cycles of moons and cycles of years, present themselves as opportune halting-places for man himself. No less were the all-important periodical rises of fertilising rivers, and the anniversaries of importations and inventions of new implements for the better cultivation of the soil, or tending of the flocks, befittingly celebrated. The inherent human tendency towards referring all things of graver import, life and death, abundance and want, victory and defeat, to a higher power, could not but infuse a religious feeling into epochs so marked. Fostered and guided by priests and lawgivers, this property of our nature erelong found its expression in common sacrifices, prayers, and ceremonies, consecrated to the various superior and minor deities who presided over and inhabited the elements of the visible and invisible creation, and who, working all the changes within them, acted, each in his sphere, as a partial providence over man. According to the event which called them forth, these festivals were mournful or joyous, jubilant or expiatory. Even when sorrow was to be expressed, the mortification of the body did not always suffice, but plays, songs, dances, and processions full of boisterous mirth, were resorted to—as in the festivals of Isis at Busiris, of Mars at Papremis, in the Adonia of Egypt, Phœnicia, and Greece—because the divine wrath or sorrow was, like that of man, to be changed into satisfaction. Besides the relation between the common tutelary deity and those he protected, the bond also by which the otherwise disconnected members of the body politic were held together was, by means of these festive gatherings, periodically brought in view, and invested with greater strength and importance. Apart, however, from this their historical, astronomical, religious, and political end, festivals served another purpose—that of growing civilisation. It was the glowing spirit of emulation which, stimulating the gifted in mind and body to strive for the festive laurel in contests of genius and skill, in honour of the gods, and in the face of all the people, matured all that was noble and brilliant within the community. Archaic rudeness and rustic extravagance became refined grace and classic harmony. The stirring drama, the glorious anthem, the melodious dance, the elegant game, which accompanied the festive sacrifice of some nations at their highest stage of development, had arisen out of those very mimicries and shouts, rude and savage beyond expression, of generations not long before them. Enthusiastic, wild, metaphysical Egypt invested the countless days consecrated to her deified stars, plants, animals, and ideas; to the Nile, to Ammon, Kneph, Menes, Osiris; to Horus, to Neitha, to Ptah, with a mystery, sensuality, and mournfulness always exaggerated, sometimes monstrous. The Hindu, no longer daring to offer human sacrifices, shews his odd and cruel materialism by throwing into the waves, on his festival of rivers, some of his costliest goods, gold, jewels, garments, and instruments; while in the licentiousness and debaucheries perpetrated on the festival of Shiva, the god of procreation, or on the Bacchantics of the goddess Bhavani, he exceeds even those of the Egyptians on their Neitha feasts at Bubastis, and the Greek worship of Venus in her Cyprian groves. Phœnicians and Assyrians, Babylonians and Phrygians, according to the little we know of their religions and manners, appear to have feasted, thanked, propitiated, mourned all at different times, and in the way most befitting their several natures, even in the case of those gods and festivals which they had in common.

The ancient Persians alone of all nations had no festivals, as they had no temples and no common worship. These 'Puritans of Polytheism,' who worshipped the sun only, and his representative on earth, fire, scorned show and pomp, and large religious gatherings. A striking contrast to them is formed, in another hemisphere, by the ancient Mexicans, who were found to possess one of the most richly developed calendars of festivals, scientifically divided into movable and immovable feasts. As a strange and singular phenomenon among festivals, we may also mention here that 'of the Dead or Souls,' celebrated among the wild tribes of North America. At a certain time, all the graves are emptied, and the remains of the bodies buried since the last festival are taken out by the relatives, and thrown together into a large common mound, amid great rejoicings and solemnities, to which all the neighbouring tribes are invited.

Greece had received the types of civilisation, religion, and art from Egypt and the East generally, but she developed them all in a manner befitting her glorious clime and the joyous genius of her sons. At the time of the *Iliad*, two principal festivals only—the harvest and the vintage—seem to have been celebrated (ix. 250); but they increased with such rapidity, that in the days of Pericles they had reached the number of a thousand; some indeed being an epitome only of their memorable feats of arms, others restricted to one town, or province, or profession, or sex, or to a few initiated, or recurring only at intervals of several years; but there were still so many kept by the whole people, that ancient writers bitterly denounce them as merry beginnings of a sad end, as the slow but sure ruin of the commonwealth. Their forebodings proved true enough; and yet Greece would certainly never have reached the highest place among nations, as far as literature, the arts, and philosophy are concerned, had it not been for the constant contests attached to her many festivals. She resisted Asia, because her citizens were always alert, always ready. The religious part of the festival—homage offered to personified ideas—consisted mostly in the carrying about of the deity of the day to the sound of flute, lyre, and hymns, and in a sacrifice, followed by a general meal upon certain portions of the animal offered. Then followed scenic representations symbolising the deeds of the gods; after which came games and matches of all kinds—foot, horse, and chariot races, leaping, boxing, throwing, wrestling, &c. Separate accounts are given of some of the more remarkable Greek festivals. See BACCHUS, ELEUSINIAN MYSTERIES, PANATHENAIA, &c. There were also special times set aside for the 'Holy Games' proper. The most important of these were the Olympian, the Pythian, the Nemean, and the Isthmian. (See these heads.) As all these festivities were provided out of the public purse—from the confiscated estates of the 'tyrants' and political delinquents—the individual did not suffer more than a welcome interruption of his usual business, and under that genial sky the penalty to be paid for occasional indolence was not too heavy.

Rome, founded amid pastoral festivities in honour of some god Pales, adopted and acclimatised, as she went on from conquest to conquest, the foreign deities, exactly as, with her usual prudence and practical sense, she conferred her right of citizenship on her foreign inhabitants, and on whole nations subjected to her rule. Her yoke was thus less galling to the new provinces, while at the same time the populace at home found sufficient distraction in the many ancient and newly imported festivals, with their quaint rites and gorgeous pageantry. Yet the Romans—more parsimonious and abstract by nature than the vivacious Greek neighbours from whom they had accepted the greatest part of their religion—never exceeded in their festivals the number of one hundred, and in these, again, a distinct line was drawn between civil and religious ones. Some of the principal religious festivals were the Sementinæ, on the 25th of January—the rural festival of the seed-time; the Lupercalia, in honour of Pan; the Cerealia; the night festival of the Bona Dea; Matronalia; Minervalia; &c. To the purely civil ones belong the Janualia, the 1st of January and the new-year's day, when the new consuls entered upon their office, and friends used to send presents (*strenœ*) to each other; the Quirinalia, in memory of Romulus, deified under the name of Quirinus; and the Saturnalia, in remembrance of the golden age of Saturn, beginning on the 19th of December. The celebration of these festivals was in all respects imitated from the Greeks, with this difference only, that the games connected with them became, with the pre-eminently bellicose Romans, terribly lifelike images of war. Their sham sea-fights; their pitched battles between horse and foot, between wild beasts and men; their so-called Trojan games, executed by the flower of the nobility; their boxing-matches (with gloves that had lead and iron sewed into them): circus, arena, and amphitheatre gave, especially in later times, the greater satisfaction the greater the number of victims.

It is one thing only that monotheism has in common with polytheism with respect to its festivals—namely, that they are with each the religious expression of human joy or human sorrow. But if the former, with a dim misgiving of some awful and supreme power, invited the multifarious governors of the many provinces of nature to partake, as guests, of bodily and intellectual feasts, *together* with their hosts; monotheism, in binding up all fear and all hope, all gratitude and all awe, which moved the heart of man, in one almighty Creator, Mover, and Maintainer of all things, celebrated its festivals in honour of this omnipresent Spirit with a veneration, a purity, and a lofty elevation, such as the worshippers of star, animal, or image never knew. With the first and strictest monotheists, the Hebrews, whose very existence as a nation was traced to the special and miraculous interference of this highest and only God, the remembrance of that great event, their liberation from Egypt, and the momentous period of preparation in the desert which followed it, mingled with almost all their religious observances, and especially their festivals, and infused into them all a tone of deep and fervent gratitude; while at the same time it held ever before their eyes the cause of their nationality, and their aim and destiny 'to be a kingdom of priests and a holy people.' The Hebrew festivals, too, are of a historical, agricultural, astronomical, and political nature; but they mostly combine all these characteristics, and are always hallowed by the same religious idea, and the same piety and devotion to one and the same holy name. Connected with their festivals were no plays and no representations of a god's deeds, no games and no cruelty, no mystery and no sensuality, but the sacrifice of the day, and a special occupation with the divine law, were the visible signs of the exalted seasons. The influence of the number seven—an influence met with among most eastern nations—is seen in the recurrence of many of the Jewish solemnities. See SEVEN. The Sabbath, the first and most important of these septenary festivals, is treated of under its own head. Of the service in the temple, and of the way in which this and the other festivals were and are kept after the destruction of the temple, something will be said under HEBREWS and JEWS. The most exalted of new-moon festivals was that of the first day of the seventh month, 'the day of remembrance of the sounding' or 'of trumpets' (Lev. xxiii. 24), to which in later times, when the Seleucidian era was introduced (the Syrian year beginning with the autumnal equinox), the name of Rosh hashana (New Year) was given; notwithstanding that in Exodus (xii. 2) Nisan is spoken of as the first month of the year. After a period of six years of labour, the earth, too, was to celebrate a Sabbath-year; what it produced spontaneously belonged to the poor, the stranger, and to animals. It is remarkable that even Alexander the Great and Cæsar remitted the taxes of Judea in this year of *Shemitta* (abandoning). After a revolution of seven times seven years, the year of Jubilee or Jobel was to be celebrated, in which all the Hebrew slaves were set free, and all land which had been sold in the interval was restored to the former owners, in order that the original equilibrium in the families and tribes should be maintained intact. (These two festivals, however, were, according to the Talmud, not kept before the Babylonian captivity.) The pre-eminently agronomical and historical festivals were the three *Chaggim* (whence the Arab. *Hagg*, a pilgrim to Mecca)—viz., Pesach (Passover), Schabuoth (Feast of Weeks), and Succoth (Feast of Tabernacles), on which three every male was obliged to go up to Jerusalem and offer some of the first fruits, besides the prescribed sacrifices (see PASSOVER, &c.).

The postmosaic and exclusively historical festivals, Purim, the feast of Haman, Chanuca, the feast of the Maccabees, will be noticed in the articles on JEWS, and JEWISH RITES.

Only a cursory glance can be here taken of the Christian festivals, which are treated fully and separately under their various names. They were for the most part grafted, in the course of time, upon the Jewish and Pagan ones, but always with a distinct reference to Christ and other holy personages. The weekly day of rest was transferred from Saturday to Sunday, and called the Day of Joy, or Resurrection, just as the weekly Jewish fasts of Monday and Thursday were changed for Wednesday and Friday. See FASTS. For a long time, both Saturday and Sunday were celebrated, especially in the East. Two separate celebrations took the place of the Jewish Passover: the *Pascha Staurosimon* was the festival of the Death, the *Pascha Anastasimon* of the Resurrection of our Lord (see EASTER); and the festival of Pentecost, or the law-giving at Sinai, became the festival of the outpouring of the Holy Ghost and of the inauguration of the New Covenant.

In the course of the 4th c., two new festivals were introduced: Epiphany (q. v.), which originated in the East; and that of the Nativity or Christmas (q. v.). Circumcision, Corpus Domini, the festivals of the Cross, of Transfiguration, of the Trinity, and many others, are of still later date. The veneration felt for Mary as the 'Mother of God,' found its expression likewise in the consecration of many days to her special service and worship; such as that of her Presentation, Annunciation (Lady's Day), Assumption, Visitation, Immaculate Conception (q. v.), and many minor festivals, over and above the Saturdays, which in some parts were entirely dedicated to her, in order that the Mother might have her weekly day like the Son. Besides these, there were festivals of Angels, of Apostles, Saints, Martyrs (on the supposed anniversary of their death, called their birthday, *dies natalis*), of Souls, Ordinations, &c.

Celebrated at first with all the primitive simplicity of genuine piety, most of these festivals were ere long invested with such pomp and splendour that they surpassed those of the ancient Greeks and Romans. Burlesque, even coarse and profane representations, processions, mysteries, and night-services, were, in some places, although unauthorised by the general church, connected with them, and voices within the church loudly denounced these 'pagan practices.' Ordinances forbidding mundane music and female singers for divine service were issued, the vigils were transformed into fasts, days of abstinence and penance were instituted, partly as counterpoises, but with little result. Nor did the prodigious increase of these festive occasions, and the rigour with which abstinence from labour was enforced in most cases, fail to produce the natural results of indolence and licentiousness among the large mass of the people. Bitter and frequent were the complaints throughout Christendom; but although even men like Archbishop Simon of Canterbury (1332), Petrus de Alliaco, Nicolaus of Clemangis, did their utmost to obtain a reduction of these festive occasions, which overspread well-nigh the whole year, it was only after the most decided and threatening demands, such as that pronounced by the German Diet of Nürnberg in 1522, that Pope Urban was prevailed upon to reduce the number for Catholic Christianity (1642). Benedict XIV. (1742), Clement XIV. (1773), followed in the same direction. On the change produced both in their number and in the manner of their celebration through the Reformation, we must forbear to enlarge here.

The Christian festivals have been divided variously: into *feriæ statutæ* (returning annually at fixed times), *indictæ* (extraordinary, specially proclaimed), *duplicia* (double reminiscence, or of higher importance), *semiduplicia* (half double), &c. Another division is into weekly and yearly feasts, these latter being subdivided into greater and minor, or into movable and immovable. There is also a distinction made between *integri* (whole days), *intercisi* (half-days), &c.

The only trace of the ancient manner of dating a festival from the eve or vesper of the previous day—a practice discontinued since the 12th c., when the old Roman way of counting the day from midnight to midnight was reintroduced—survives in the 'ringing in' of certain days of special solemnity on the night before, and in the fasts of the vigils.

On some of the principal Mohammedan festivals, partly based upon those of the Jews and Christians, such as the weekly Friday, the Yom Ashoora (the Jewish Day of Atonement), the Birthday of the

Prophet (Molid 'An-Nebee), that of Hussein, of Mohammed's granddaughter Zeyneb, of the Night of the Prophet's Ascension to Heaven (Leylet Al-Mearag), the Night of the Middle of the month Shaabân, in which the fate of every man is confirmed for the ensuing year; the Eed Al-Shagheer or Ramadan-Beyram, at the end of the Ramadan fasts, and the Eed Al-Kabir, or the great festival of the Sacrifice (Kurban Beyram), see MOHAMMEDANISM. For further information, see Herodotus (ii. 60); Plutarch (vii.); Strabo (vi. and x.); Ovid, *Fasti;* Macrobius, *Sat.* i. 7, 11; Meursius, *Græcia Feriata;* Meiners, *Geschichte d. Relig.;* Fasold, *Ierologia;* Bible; Mishna; Gemara; Shulchan Aruch; Josephus; Philo; Maimonides; Buxtorf, *Lex. Talm.; Synag. Jud.;* Bartolocci, *Bibl. Rabb.;* Lightfoot, *Hor. Hebr. and Talm.;* Lund, *Bibl. Hebr.;* Wette, *Archæologie;* Neander, *Hist. of the Ch.;* Blackmore, *Christ. Antiq.;* Baumgarten, *Erläuterung d. chr. Alterth.;* Siegel, *Handb. d. chr. Alterth.;* Mai, *Discorsi di Argomento Religioso;* Koran, &c.

FESTOO'N, in Architecture, a sculptured wreath of flowers or fruit, frequently used as an ornament in Roman and renaissance buildings. Like many of the other ornaments of classic architecture, it owes its origin to one of the sacrificial emblems, viz., the flowers with which the heads of the animals, the altars, &c., used to be decorated. The festoon occurs along with bulls' heads on the frieze of the temple of Vesta at Tivoli. The fig. is an example of a renaissance festoon, from the library of St Mark at Venice.

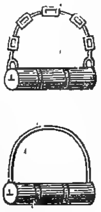
Festoon:
St Mark's Library, Venice.

FE'STUS, SEXTUS POMPEIUS, a Latin lexicographer, of the third or fourth c. of our era, is one of the most important ancient authorities we have on the Latin language. He made an epitome of the great work of Verrius Flaccus, *De Verborum Significatione.* This compilation, which was arranged alphabetically in 20 books, was still further abridged and spoiled in the end of the 8th c. by Paul, son of Warnefried, commonly called Paulus Diaconus. The great work of Flaccus has unfortunately entirely perished, and of the abridgment made by Festus, only a single MS., and that in a deplorably imperfect condition, has survived. It came from Illyria, and fell into the hands of Pomponius Lætus, a distinguished scholar of the 15th century. It ultimately passed into the library of Cardinal Farnese, at Parma, and is now preserved at Naples. The work, in spite of all its imperfections, is a grand storehouse of knowledge on points of mythology, grammar, and antiquities. All previous editions of F. are of little value compared with that of K. O. Müller (Gött. 1839), in which he has made use of the Farnese MS. and other sources, distinguishing the value of each.

FE'TICHISM is the worship of a *fetich.* The word fetich comes to us from the Portuguese, who were the first Europeans that traded on the west coast of Africa, and who expressed their idea of the religion of the natives by the Portuguese word *feitiçāo,* 'magic.' This word, somewhat modified, passed into the French language, through Brosse's treatise, *Du Culte des Dieux Fétiches* (Dijon, 1760), and from him into German, through the medium of Pistorius (Stralsund, 1785). The term has now received European recognition. A fetich is anything in nature or art to which a magical power is ascribed, e. g., stones, carved figures, or certain parts of plants, animals, &c. In this general sense fetichism coincides with the belief in charms—a belief which is also to be found among monotheistic nations. The first step *out of fetichism,* is when ignorant tribes cease to be satisfied with believing merely in the magical power inherent in their fetiches, and begin to ascribe a certain conscious operation to the objects of their reverence, especially to the fetiches in the forms of beasts or men. In this way the fetich becomes an idol, and fetichism an idolatry. The lowest form of such idolatry is where the savage does not hesitate to throw away, to chastise, or even to destroy his fetich, if it does not appear to gratify his desires. The reverence for sacred woods, mountains, streams, &c., which formed part of the religion of the old Greeks, Celts, and Germans, is not fetichism proper, but rather belongs to the worship of nature.

FE'TID LI'MESTONE, a variety of limestone which gives out, on being violently rubbed, or struck with a hammer, a smell like that of sulphuretted hydrogen gas. It has a dark colour, produced very probably from the perishable portions of the animals whose hard skeletons compose the rock. This animal matter may perhaps also be the cause of the disagreeable smell. Stinkstone or Swinestone have been likewise employed as characteristic names for this limestone.

FETLOCK, or **FETTERLOCK.** English heraldic writers speak of a horse fetlock or fetterlock, and represent it thus. It seems to have been an instrument fixed on the leg of a horse when put to pasture, for the purpose of preventing him from running off. In Scotch Heraldry, a hoop is usually substituted for the chain, and the fetlock is represented thus, as in the arms of Lokkert (Lockhart) of Barre, given by Sir David Lindsay; Argent, on a bend sable three fetterlocks *or.* Some branches of this family carry a man's heart within the fetterlock, one of the heads of it having accompanied Good Sir James Douglas with King Robert the Bruce's heart to Jerusalem (Nisbet, i. p. 325).



Fetlocks.

FEU AND **FEU-DUTY.** A feu may be described, in familiar language, as a right to the use and enjoyment of lands, houses, or other heritable subjects, in perpetuity, in consideration of an annual payment in grain or money, called *feu-duty,* and certain other contingent burdens called casualties of superiority (see CASUALTY). Though a feu was frequently used to express any kind of tenure by which the relation of superior and vassal was constituted, in its narrower meaning, which we have here indicated, and which is that in which it is now almost exclusively used, it was opposed, on the one hand, to those tenures in which the return consisted of military or other personal service (ward and the like), and on the other, to those in which the return was illusory (blanch), the only object of which was to preserve the relation of superior and vassal. A feu, in short, was a perpetual lease—a feu-farm, as it was often called—by which the tenant became bound to pay a substantial consideration, and his rights under which he might forfeit, as the penalty of non-payment. In the present day, the disposal of land in feu is practically a sale for a stipulated annual payment, equivalent to chief rent. It is in this light, accordingly, that feus are generally regarded in

Scotland; and as it is on this footing that almost all the house-property in towns and suburban villa-property is held, they form an important element in the proprietary relations of the country. The system of feuing property for building purposes seems to have several advantages over that of the long building-leases common in England. From its perpetual character, it gives to the person actually in possession a feeling of greater interest in the property, and usually leads him to erect more enduring structures than he probably would do under a lease. For as time runs on, the feu often increases in value, while the reverse must always be the case with leasehold property. Neither does it in any degree interfere with the letting of property on lease or otherwise. Almost all the houses in Edinburgh and the other towns in Scotland which are let, either on leases or from year to year, are held by those who are spoken of as their proprietors not in absolute property, but as feus. Modern feu-duties are in general paid in money. When the stipulation is for a duty in grain, the quantity is valued by fiar prices for the year (see FIARS), and paid in money accordingly. The deed transferring the land in feu from the superior to the vassal is called a feu-charter—a clumsily conceived and expensive document, which requires renewal in the case of heirs to vassals, or of parties to whom the vassal sells his right; and this repetition of the transaction, designated as 'entering with the superior,' forms the heavy drawback on the acquisition of land in feu, no matter how small in amount. Usually, the feu-charter reserves to the superior all minerals in the ground, and stipulates that the vassal shall build his house either in a particular style or of a certain value. By the Scottish stat. 1597 c. 246, it is declared that all vassals by feu-farm failing to pay their feu-duty for two years together, shall lose their right, in the same manner as if an irritant clause had been specially engrossed in their charter. But as the superior must obtain a decree declaring the loss of the vassal's right, before the forfeiture can take effect, if the feu is worth keeping, the duties, as a matter of course, will be paid. In the very rare case of the property having fallen off in value to the extent of rendering the feu a positive burden, it is possible that the irritancy may be voluntarily incurred. For the most part, land proprietors near towns and manufacturing villages are anxious to add to their annual rental by feuing grounds for building purposes. The rate of feu is very various, from as low as £8 to as high as £500 per acre per annum; a common rate is from £20 to £30 per acre. Whatever be the amount, it is payable by the feuar—not the tenant to whom the feuar may have let the property. When a building consists of several floors forming distinct dwellings, the feu-duty is allocated in certain proportions among the respective proprietors; the feuar to whom the lower floor belongs usually paying most. In properties of this kind, each is responsible only for his own share. Occasionally, feu-duties are offered for sale; and as a safe investment, bring from 25 to 30 years' purchase. In such cases, the vassal has an opportunity of extinguishing his feudal tenure, and becoming the superior. There are also instances of vassals sub-feuing. It is customary in feuing building lands for the superior to make the roads and drains. Relieved of this obligation, and getting possession of a site on a mere prospective annual payment of perhaps only a few shillings, the feuar has an undoubted advantage; looking, however, to the cumbersomeness and cost of the feu-charters, and the liability of successors to pay fines at entry, the system is entangled, troublesome, and expensive; and, at least as far as forms are concerned, is allowed to stand in need of reform.

FEUD (Angl.-Sax. *fæght*) seems to be only another form of the word *fight*, and is allied to *foe*, and probably to *fiend*. It meant a war waged by one family or small tribe on another, to avenge the death or other injury of one of its members. In a certain state of society, this is a legitimate mode of obtaining redress. It prevailed extensively among the nations of Northern Europe; and it was only by gradual steps that the practice was first restricted and then abolished. The laws of Rudolf I. of Germany recognised the right of waging feuds. At last, partial associations were formed, the members of which bound themselves mutually to settle their differences by courts of arbitration and compensation, without going to war.

FEU'DAL SYSTEM. By some, the word feu or feud, of which feudal is the adjective, is derived from the Lat. *fides*, faith, and *ead* or *odh*, or *od*, a Teutonic word signifying a property, or estate, in land; whilst by others, with perhaps greater probability, the first syllable also is maintained to be Teutonic, equivalent to *vieh*, cattle, ultimately from the same root with the Latin *pecus*, which, in the form of pecunia, came to signify property, and its representative, money—because, as Varro remarks, property amongst pastoral nations consisted of cattle (Varr., *De Lingua Latina*, 5, 19, s. 95, ed. Müll). A feudum, in this sense, would be a piece of land held for a *fee*, or pecuniary consideration, using pecuniary in the wide sense which its etymology suggests. Be this as it may, the feudal system, as a developed institution, belonged neither to the Teutonic nor to the Romanic nations, in their original and unmixed condition. We find it neither in the woods of Germany, nor in the Roman empire previous to the incursions of the Franks and Lombards. Neither the institutions described by Tacitus, nor those with which the Roman jurists have rendered us familiar, exhibit anything that is even analogous to it as a whole. But they each exhibit partial indications of some of the characteristics which most peculiarly distinguish it; and as it arose about the beginning of the 9th c., just when the fusion between the conquering barbarians and the subject populations of the Romanised provinces was everywhere taking place, it seems impossible to doubt that it was a result of the mutual influence of the two races. The subordination of class to class, and the intimate relations by which all the classes of the community were bound together, taken along with the independence and equality of the individual members of each class within itself, were amongst the most prominent features of the simple society of the Teutonic nations; and these correspond with wonderful accuracy to the relations of superior and vassal, beginning with the sovereign and descending to the smallest feudal proprietor, and also with the equality amongst *peers*, which existed within each of the feudal classes. On the other hand, the incomplete and fiduciary character of the proprietorship implied in a *feu*, as held in trust from a superior on the faith of services to be rendered, or dues to be paid, bore a very close analogy to the Roman emphyteusis (from which indeed the word feu has often been derived), and to the *dominium utile* as opposed to the *dominium directum*. See DOMINIUM and EMPHYTEUSIS.

The nature of this very important social institution, by which the life of every European people of any importance was governed from the beginning of the 9th till the close of the 13th c., and by which many of the forms of our modern life are still effected, will probably be more clearly understood if we commence our description of it from below, by exhibiting the position of the simple landholder, than by adopting the monarch in whom it culminated, and from whom, in a technical sense, it was supposed to flow (see ALLODIUM), as our point of departure. The latter course has been more strictly adhered to by English writers, from the circumstance that, subsequent to the Conquest, the whole territory of England was regarded as the property of the conqueror, and was by him divided amongst his barons, and by them amongst their dependents, an arrangement which was somewhat peculiar to England (see ALLODIAL), whereas the feudal system, in its essentials, was common to the whole of Europe. A feudal proprietor, then, or feudatory, was a person who held his lands from another, for his own lifetime merely, in the earlier times, on condition of certain services which he was to perform to a superior or suzerain. Apart from the duties to which he was thus bound, he was not only a free man, but his position was that almost of an independent sovereign within his own small dominions. If his holding was at all an extensive one, he lived in a castle, which, notwithstanding the efforts of Charlemagne and his successors to prevent it, was generally fortified, not only for purposes of defence, but to enable him to pursue that life of rapine which in lawless times was not considered inconsistent with honesty or personal worth. For greater security, the castle was generally situated on a height, and under its walls there nestled a village, in which all the dependents of the proprietor, with the exception of his immediate family, and all those who lived by the cultivation of the soil, usually dwelt —isolated farmhouses and cottages being too much exposed to plunder to admit of their being scattered over the county then, as we see them in England now. A portion of the inhabitants of each feudal domain were usually bound to the soil, and were thus subject to a species of slavery, the conditions of which varied according to the customs of different districts. These were spoken of as *adscripti* or *adscriptitii glebæ*, and were called *nativi*, or bondmen, and *villein-socmen*, as opposed to free-socmen on the one hand, and serfs or *theowes* on the other, of whose position we shall speak below. (Stephen's *Com.* i. p. 188.) 'He was,' says Sir Francis Palgrave, speaking of the ceorl, 'a villain appurtenant; and, notwithstanding the language which was employed (to the effect, namely, that he could be bequeathed, bought, and sold), it must be understood that the gift, the bequest, or the sale, was in effect the disposition of the land and of the ceorl, and of the services which the ceorl performed for the land, a transaction widely differing from the transfer of a slave, whose person is the subject of the purchase.' (*Rise and Progress of the English Commonwealth*, vol. i. p. 18.) The ceorl, moreover, could purchase his own freedom and that of his wife and offspring (*Ib.*). See VILLEIN. The rest were free tenants, farmers in the modern sense, though personal services to the proprietor probably in almost every case constituted a portion of the rent which was paid. Latterly, when the system of subinfeudation was introduced, many of his wealthier tenants came to stand to the baron, or lord of the domain, very much in the relation which we are about to describe as subsisting between him and his lord paramount. From being tenants-at-will, scarcely less subject to his authority and exposed to his caprices than the thralls, or villeins of the lowest class, they became vassals of their lord, and free citizens of what thus gradually developed itself into a feudal monarchy in miniature. The tenure by which this latter class held their lands was generally known in England as Free Socage (Stephen's *ut sup.* i. 205 *et seq.*). The castles by which the banks of the Rhine are studded along its whole course, from Bonn to Bingen, with their villages and parish churches, for the most part in the condition in which they were erected centuries ago, afford the most numerous and perfect examples of the arrangements of the feudal period which are perhaps anywhere to be met with. The possessors of these castles stood in a magisterial as well as a proprietary relation to their dependents. They exercised jurisdiction, extending even to the infliction of capital punishment, either in person or by means of officers whom they appointed for the purpose; and the castle was in general furnished with dungeons and other appliances for carrying their sentences into execution. Towards each other they stood in the relation of equals, or peers (Lat. *pares*); they were neighbours, simply, and friends or enemies as the case might be—too often the latter. But towards their immediate feudal superior, the count, marquis, duke, or whatever might be his title, to whom the government of the whole district belonged, they all stood in a relation which brought them in contact, and in some degree bound them to each other. Of him they held their lands on conditions somewhat similar to those on which they let them out to their own dependents. At first, as we have said, they were only tenants for life; but their rights in most countries very early assumed a hereditary character, the dominant proprietor's rights, on the death of a tenant, being confined to the exaction of certain dues from his son and successor, as a consideration for conferring on him, or rather for confirming to him, the feu which his father had held. Where the feu, fief or feoff, as it was sometimes called from the mode of admission —feoffment, or, as it is said in Scotland, infeftment (q. v.)—descended to a female, the dominant proprietor was entitled to control her marriage, for the purpose of procuring himself a sufficient and trustworthy vassal; a privilege which, like all those of the lord, was latterly converted into a mere pecuniary claim. When the lord paramount, or suzerain, as he was called, held his court of justice, his vassal barons were the judges, being all on a footing of equality, or *pares curiæ*, as it was called. When he made war, either on his own account, or as furnishing a contingent to the army of the state, in such cases as in the national wars between France and England in the 12th and 13th centuries—which were the earliest instances of really national wars—his vassals were bound to attend him in person, and to furnish each the contribution of men, horses, arms, and other materials of war for which he was liable by the tenure on which he held his lands. In addition to these services, he was bound to watch and ward his castle, a duty which the minor barons almost invariably imposed on their vassals when the system of granting feus extended downwards to the class of persons who had formerly been mere tenants-at-will. Then there were certain dues which were almost always exigible from the vassal, such, e. g., as contributions towards providing a ransom for his lord when in captivity, for enabling him to celebrate the marriage of his eldest son with due pomp, or to provide a suitable dowry for his daughter. If these dues were not paid, the land reverted to the dominant proprietor, in relation to whom the vassal all along was a mere usufructuary. So far were the conditions of feudal holdings from being always the same, that no less than eighty different tenures have been enumerated; the onorous character of which varied from what was merely nominal, e. g., the payment of a white rose or a pair of spurs, 'if asked merely,' up to what was a rent in some degree equivalent to the value of the land. For an account of the manner in which the feudal system affected the constitution of land rights and the conveyance of landed property, and still affects them, see CONVEYANCING.

Inferior to all the classes of society in feudal Europe of which we have hitherto spoken, there is reason to fear that there existed almost everywhere, in the earlier times, a class of the positively unfree. The lot of those who were in absolute slavery excluded them from the influences of feudality as a legal and social institution—'they were not reckoned,' says Palgrave, 'amongst the people'—but their existence is by no means to be left out of account, in forming to ourselves a picture of European society in feudal times. Of the condition of this class, as forming the substratum of feudal society, we shall have a pretty accurate conception from the following passage, in which Lappenberg describes them in Anglo-Saxon times, if we bear in mind, on the one hand, that subsequently to the Conquest their ranks were probably swelled by such of the Anglo-Saxon population as was in absolute poverty; and on the other, that their position, in all the countries of Europe, was gradually ameliorated by the influences of Christianity, the spirit if not the letter of which has everywhere proved hostile to slavery. 'One class of the Anglo-Saxon population, at the period of the Norman Conquest, consisted of the unfree or servile (*theowas*, *esnas*), whose number, as registered in Domesday-book, was little above 25,000. Of these, the majority were in a state of slavery by birth, whose forefathers had been either Roman slaves, British prisoners of war, or other enemies. Others, denominated, *wite-theowas*, or penal slaves, had been freemen, but reduced by the sentence of the law to the servile condition, on account of debt or delinquency. (Palgrave *ut sup.* i. 28.) The master had the right of selling the theow in the country, but not beyond the sea, even if he had perpetrated crime. In other respects, the condition of the servile seems to have differed little from that of the indigent free slaves who had a special wergild, half of which fell to the master and half to the kin.' (Thorpe's Lappenberg, ii. p. 320.) It is probable that the vast majority of the servile class in Anglo-Saxon, and even in Norman times, consisted of persons of Celtic blood. (Palgrave *ut sup.* p. 26.) In proof of this fact, Lappenberg remarks that their numbers diminish as we recede from the Welsh border and from Cornwall, the places in which the Celtic or original British population is known to have taken refuge.

The social elements which counteracted and mitigated the influences of feudality in mediæval life, were monarchy, the church, which vigorously promoted the emancipation of the unfree, and above all, the growing wealth, power, and importance of the commons. In order to free himself from the rude and insolent dictation of his great feudal vassals, the king, in almost every European state, courted the alliance of the town communities, who had remained more in the condition in which they had been left by the Romans than the inhabitants of the country, and who were consequently all along more or less opposed to the growth and influences of feudality. See MUNICIPIUM. By their aid, even before the formation of standing armies, something approaching to executive power was placed in the hands of the sovereign. He was thus enabled to appoint and enforce the decrees of independent judges of his own, who in the earlier time were generally churchmen, and thus greatly to circumscribe the power and influence of all classes of feudal proprietors over their dependents. Though the period of bloom of the feudal system was, as we have said, from the 9th to the 13th centuries, in most of the countries of Europe, it everywhere, in many of its features, long survived the latter period. Even considered as a social, and not merely as a legal institution, in which latter capacity it still exists, it was in many respects in vigour in Scotland down to the year 1747, when military tenures were abolished by statute, as dangerous to public tranquillity.

FEU DE JOIE, or 'running-fire,' a discharge of musketry into the air, made in honour of a victory or other great occasion. It commences with the right-hand man of the line, who discharges his rifle, and is followed successively, at scarcely perceptible intervals, by the men on his left, until the extreme left of the line is reached. The effect much depends on the regularity with which the slight interval between the discharges is preserved.

FEU'ERBACH, PAUL JOHANN ANSELM, RITTER VON, one of the most distinguished criminal jurists of Germany, was born at Jena 14th November 1775. Brought up at Frankfurt-on-the-Maine, where his father was an advocate, and educated in the gymnasium there, he went in 1792 to Jena, where he cultivated his mind by the study of philosophy, and then devoted himself to positive law. In 1798 he appeared as criminal jurist in a work *On the Crime of High Treason*, and in the following year he began to deliver lectures in the university of Jena. In his lectures and published writings, he introduced into criminal jurisprudence a new method of treatment, which was systematised in his Compendium of German Penal Law (*Lehrbuch des Gemeinen, in Deutschland geltenden peinlichen Privatrechts*, Giessen, 1801; 14 Aufl. von Mittermaier, 1847). This celebrated work placed F. at the head of a new school of jurists, who maintain that the decision of the judge in every case ought to be determined solely by an express deliverance of the penal law, never by his own discretion, and who on that account obtained the name of Rigorists. In 1801 F. was appointed ordinary professor in Jena, but in 1802 accepted a call to Kiel. In 1804 he was removed to the university of Landshut; but next year, having received a commission to prepare a penal code for Bavaria, he was transferred to Munich as privy referendary for the ministerial, judicial, and police departments; and in 1808 was appointed privy-councillor. The new penal code which he planned for Bavaria (*Strafgesetzbuch für das Königreich Baiern*, München, 1813), received, after a few modifications, the royal approval, and was taken as a basis in the emendation of the criminal law of several other countries. During this period also, he published his Remarkable Cases in Criminal Law (*Merkwürdige Criminalrechtsfälle*, 2 Bde., Giessen, 1808—1811), which first led the way to a deeper psychological treatment of such cases. In 1812, he published a work on Trial by Jury, to which a second volume, on the Judicial Procedure of France, was added in 1825, as the result of a visit to Paris in 1821. In 1817 he became second president of the Court of Appeal in Bamberg, and afterwards first president of the Court of Appeal at Anspach for the Rezat district. In 1832 he published a work on the unfortunate Kaspar Hauser, whose mysterious fate had strongly attracted his interest. He had just edited a collection of his miscellaneous writings, when he died at Frankfurt-on-the-Maine 25th May 1833. An interesting life of F. has been written by his son, Ludwig (*Leben und Wirken Anselm von Feuerbachs*, 2 Bde., Leip. 1852). F. left, besides three daughters, five sons, who have all distinguished themselves in German literature.

FEUERBACH, Ludwig Andreas, German philosopher, fourth son of the preceding, was born at Anspach, 28th July 1804. After studying theology for two years at Heidelberg under Paulus and Daub, in 1824 he was attracted to Berlin for the purpose of hearing Hegel, and soon after he abandoned theology, with the view of devoting himself entirely to philosophy. In 1828 he became *privatdocent* in the university of Erlangen, but in a few years quitted the academical chair, and gave up his whole time to literary labour. In a small anonymous work (*Gedanken über Tod und Unsterblichkeit*, Nürnberg, 1830), which attracted little attention when it appeared, he indicated that he had already gone beyond the standpoint of his master Hegel, by combating the doctrine of immortality. During the next few years, he published three works on portions of the history of philosophy, treating severally of the period between Bacon and Spinoza, of Leibnitz and of Pierre Bayle. But these historical works only paved the way to a critical investigation into the nature of religion and its relation to philosophy, the results of which have been given to the world in several works well known to speculative theologians. The most celebrated of these is his work on the Nature of Christianity (*Das Wesen des Christenthums*, Leip. 1841; 2 Aufl. 1843), which has been translated into English. Starting from the Hegelian doctrine, that the Absolute comes to consciousness only in humanity, F. denies to it any existence beyond the human consciousness, maintaining it to be merely the projection by man of his own ideal into the objective world, on which he feels his dependence. All authority above man, and consequently all moral obligation, is therefore consistently regarded as a delusion proceeding from man himself, and the highest good is explained as that which is on the whole most pleasurable. Yet even this highest good is further explained as consisting in resemblance to that ideal humanity which man creates for himself, and worships as God. A kind of ideal theism is therefore retained by F.; but when his doctrines were adopted by the mass of German communists, they degenerated, perhaps logically, into an actual atheism, which ignored any moral or social law imposed on the individual from any other source than himself.—The works of F. have been collected, with additions and corrections to bring them into accordance with his later views (*F.'s Sämmtliche Werke*, 8 Bde., Leip. 1846—1851), and since then he has published a work entitled *Theogonie* (1857).

FEUILLANS, Congregation of, a reform of the Cistercian order, remarkable as forming part of the great religious movement in the Roman Catholic Church during the 16th c., contemporary with and probably stimulated by the progress of the Reformation. The author of this reform was Jean de la Barriere, abbot of the Cistercian monastery of Feuillans, who, painfully struck by the relaxation of its discipline, laid down for himself a new and much more austere course of life, in which he soon found many imitators and associates among the brethren of his order. The rule thus reformed was, after considerable opposition from the advocates of the old rule, approved, with certain modifications, by Pope Sixtus V.; the reformed congregation, however, being still left subject to the authority of the abbot of Citeaux; and a convent was founded for them by Henry III. in the Rue St Honoré, Paris. The subjection to the abbot of Citeaux was removed by Clement VIII. in 1595; and Urban VII., in 1630, separated the congregation into two branches, one for France, and the other for Italy, each under a distinct general. The rules of both these branches were subsequently modified about the middle of the same century.

The celebrated revolutionary club of the Feuillants took its name from this order, the convent of which, in the Rue St Honoré, was the place of meeting for the members of the club. It was founded in 1790 by Lafayette, Sièyes, Larochefoucauld, and others holding moderate opinions. The club was at first called the 'Company of 1789,' and was intended to support the constitution against the ultra party. It reckoned among its members individuals of all classes, who took the constitution of England as their model. This opposition served, however, only to accelerate the revolutionary movement. On the 27th January 1791, on Count Clermont Tonnerre being elected president of the club, a popular insurrection broke out against it; and, on the 28th March, the assembly in the cloister was forcibly dispersed by a raging mob.

FEUILLETON (Fr.), literally a small leaf, signifies that portion of a political newspaper set apart for intelligence of a non-political character, for criticisms on art, literature, &c., and usually separated from the main sheet by a line. The feuilleton is an invention of the *Journal des Débats*, which, since the year 1800, has held an important place in the sphere of literary criticism. By degrees, the belles-lettres element began to pervade it; and the result was a species of light journalistic literature, in which Jules Janin became the acknowledged king. In the years immediately preceding the February revolution, entire romances were spun out in the feuilleton. The *Constitutionnel*, in particular, made large pecuniary profits by the social romances of Eugene Sue, which it published in this manner. The French system has been imitated in England and Germany, though with less success than in France.

FEVE'DA, an island of British Columbia, is situated in the Gulf of Georgia, between Vancouver Island and the continent. It is in lat. 49° 41′ N., and long. 124° W., measuring 32 miles in length by 2 in average breadth. It possesses a snug little harbour, which appears to be all the more valuable on account of the superior quality of the fuel which abounds on the spot. Its formation is understood to be wholly of limestone.

FEVER (Lat. *fĕbris*, from *fervĕō*, I grow warm, or perhaps from *fĕbrŭō*, I cleanse), a form of disease characterised principally by increase of the temperature of the body, which, however, requires to be estimated according to the state of the internal parts, rather than the external; the surface of the body, and particularly of the extremities, being not unfrequently cold rather than warm. Having regard to the heat of the surface only, fever has commonly been considered as passing through three distinct stages, more or less marked: 1, the cold or shivering stage; 2, the hot stage; 3, the sweating stage. This description is perfectly correct in most cases, but it requires to be qualified by the remark, that even in the cold stage of fevers, it is now well ascertained that the blood and the internal organs have an elevated temperature, as estimated by the thermometer introduced into the cavities of the body. In the cold stage of fever, accordingly, and even in the most violent ague, when the teeth are chattering with cold, and the whole surface is pale and clammy, the state of the system is well expressed by the aphorism of Virchow (the most ingenious and comprehensive of the modern exponents of the pathology of fever), to the effect that 'the outer parts freeze while the inner burn.' Increased heat of the body, therefore, is the most essential, perhaps the only essential phenomenon of fever. The other symptoms are loss of appetite, thirst, restlessness, and vague general uneasiness, often headache, and diffused pains in the back and limbs; a frequent pulse, which is sometimes also full and hard; a furred tongue, often with red margin; a flushed face and suffused eyes; vitiated secretions, and general derangement of the functions, with great debility of the voluntary movements of the limbs. The disease often commences with a shivering, or rigor, as it is technically called; this leads through the cold stage to the hot, which usually follows pretty rapidly, and is attended by all the febrile phenomena in their highest degree; the skin being often very pungently warm to the hand, dry, and harsh; by and by, the pores appear to open, moisture begins to bedew the surface, and the pungent heat disappears: the disease is then about to pass into its third or sweating stage, which ushers in the convalescence. For the special symptoms of particular fevers, see Typhus and Typhoid Fevers, Small-pox, Scarlet Fever, Measles, Ague, Intermittent and Remittent Fever, Yellow Fever.

Besides being thus the leading fact in a number of specific diseases, fever is also associated with many other forms of disease as a secondary or subordinate phenomenon, connected with an inflammation or other distinctly local disease. Thus, in Pneumonia (q. v.) or Enteritis (q. v.), fever is as much a part of the symptoms as pain or any other; and even in some chronic or long-standing diseases, as in Consumption (q. v.), a slow and consuming type of fever (see Hectic Fever) is found to be very generally present. Indeed, there is no condition which rules so large a part of the physician's duty, whether in the way of distinguishing diseases or of curing them, as this constitutional state. Fever is also very generally prevalent after surgical operations and injuries, of which it constitutes one of the leading dangers; and in midwifery practice, it is well known as constituting a large part of the risks of the puerperal state, whether in the slighter form commonly called *a weed*, or in the more dreaded and fatal, often epidemic, form of Puerperal Fever (q. v.).

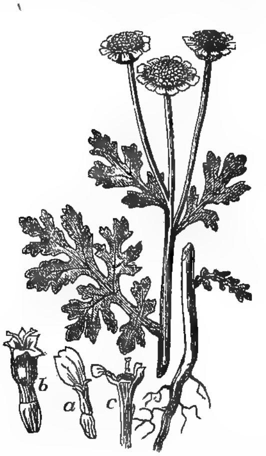
The family of fevers is thus separated pretty naturally into two large groups, in one of which the fever is the greatly predominating fact, and determines the specific character of the disease: the local disease (if present) being quite subordinate, and usually secondary in point of time; the other, where the opposite order prevails, and the fever is obviously secondary. Hence the distinction embodied in medical language between *idiopathic* (i. e., self-originating, spontaneous) and *symptomatic* or secondary fevers. Fevers are also distinguished, with reference to their mode of diffusion, as Epidemic (q. v.) and Endemic (q. v.); or with reference to their supposed cause, as contagious, infectious, malarious, pneumonic, rheumatic, &c.; or with reference to their incidental symptoms and their peculiarities of course and termination (the presumed *specific* phenomena attracting, of course, particular attention), as eruptive (see Exanthemata) or non-eruptive, bilious, gastric, enteric, mucous, putrid, malignant, typhoid, &c.

Among these distinctions, based upon the course of the fever, one demands particular notice, as involving an important law of febrile diseases generally, and of a large class of fevers of warm climates in particular. Periodic increase and diminution, or paroxysms of longer or shorter duration, with intervals of more or less perfect relief from all the symptoms, are characteristic of most diseases of this kind, but especially of those arising from *malaria*, i. e., emanations from the soil, educed under the influence of solar heat. The duration of the paroxysms and of the intervals, the complete *intermission*, or more partial *remission*, of symptoms, become in such cases the characteristic facts that mark the *type*, as it is called, of the fever, which is accordingly distinguished as intermittent, remittent, or continued; and, according to the length of the periods, Tertian, Quartan, Quotidian, &c. (q. v.).

The true pathology, or ultimate essence of the febrile state, is still a subject open to question; but it is in accordance with modern physiology to regard fever as connected with some complex derangement of the functions on which the animal heat is known to depend—viz., the nutrition of the textures, or the vital changes constantly in operation between the blood, on the one hand, and the ultimate atoms of solid texture, on the other. Recent observations have shewn that, in the paroxysm of ague, the waste of the nitrogenous tissues is in excess; and further, the curious result appears to be arrived at, that for almost every grain of excretion representing this excess of waste in a given time, there is a proportional increase of the temperature of the blood, according to accurate thermometric observations. If such observations are corroborated and extended, it will probably appear that the cause of fever is to be found in an increased destructive decomposition of the atoms of texture through the oxygen absorbed at the lungs and circulated with the blood; perhaps under the influence of a derangement of nervous system; which has been shewn by experiment to have a very marked control over the generation of animal heat.

The treatment of fever will be considered under the separate forms already referred to.

FE'VERFEW (*Pyrethrum parthenium* or *Matricaria parthenium*), a perennial plant, found in waste places and near hedges in Britain and many parts of Europe. It is botanically allied to Chamomile (q. v.), and still more nearly to Wild Chamomile (*Matricaria chamomilla*), and much resembles these plants in its properties, but differs in appearance, the segments of its leaves being flat and comparatively broad, and its flowers smaller. Its habit of growth is erect, its stem much branched, and about 1—2 feet high. It has a strong, somewhat aromatic smell. It was once



Common Feverfew (*Matricaria parthenium*):
a, floret of the ray; *b*, floret of the disc; *c*, fruit, shewing the toothed membranous pappus.

a popular remedy in ague, and from time immemorial has been used as an emmenagogue. It is employed in infusion, and is stimulant and tonic. A double variety is not uncommon in gardens.—Of the same genus with F. is the MAYWEED (*P. inodorum* or *M. inodora*), with leaves more resembling those of chamomile, but almost scentless, and large flowers, with white ray and yellow disc, very common in cornfields and waste places in Britain and throughout Europe.

FE'VERWORT (*Triosteum perfoliatum*), a perennial plant of the natural order *Caprifoliaceæ*, having an erect, round, hairy, fistular stem, from one to four feet high, opposite ovato-lanceolate entire leaves, axillary whorls of flowers, with tubular 5-lobed corolla, and leathery 3-seeded berries. It is a native of North America, where its dried and roasted berries have been occasionally used as a substitute for coffee; but it is chiefly valued for its medicinal properties, its roots acting as an emetic and mild cathartic. It is sometimes called *Tinkar's Root*, from Dr Tinkar, who first brought it into notice.

FEZ (Ar. *Fas*), the chief and most northerly province of the empire of Marocco, occupies the country between the Atlas Mountains and the Mediterranean. Its population is estimated at about 3,200,000, consisting of Berbers, Moors, Arabs, Negroes, Jews, and a few Europeans. The province is divided into fifteen districts.—FEZ, the capital of the province, in lat. 34° 6′ N., and long. about 5° 0′ W., was founded by Muley Edris II., in the year 808 A.D., and was reckoned during the middle ages—when it was the capital of the kingdom of Marocco—one of the most magnificent and largest cities in the Mohammedan world. It is said to have contained about 90,000 dwelling-houses, and about 700 mosques, and was celebrated for its splendid public buildings, schools, and scientific institutions. On the removal of the court to Marocco, about the middle of the 16th c., F. gradually fell into decay. It is still, however, a place of considerable importance. The situation of F. is singular; it lies in a valley, formed by surrounding hills into a sort of funnel, the higher parts of which are covered with trees, orange groves, and orchards. It is divided into Old and New F. by one of the upper branches of the Sebu, and has a population variously estimated at from 20,000 to nearly 90,000 souls. There are 100 mosques, of which the most important is that built by the Sultan Muley Edris, which contains his monument, and is an inviolable refuge for criminals, however guilty. On account of its numerous mosques and relics, it is regarded as the Holy City of the western Arabs. It has seven well-attended schools. The old palace of the sultan is large, but is now falling into decay. In other respects, the external aspect of F., with its numerous baths, caravanseras (of which there are about 200), and bazaars, resembles that of Mohammedan towns in general; the multitude of hotels and shops alone imparting to it a peculiar and more European character. A considerable trade is still carried on, by means of caravans, with the adjoining countries on the south and east, extending as far as Timbuktu. F. carries on manufactures of woollens, sashes, silk-stuffs, girdles, slippers, fine carpets, &c. Its artisans are also skilful workers in gold and jewellery.

FEZZA'N (more correctly, FESSÂN), an extensive oasis in the north of Africa, in 24°—31° N. lat., and 12°—18° E. long. It lies south of the regency of Tripoli, and has a population variously estimated at from 75,000 to 150,000 souls. The north is for the most part hills, but the hills are composed of perfectly bare, black quartz sandstone, with no rivers or brooks among them, and the south is mainly a level waste of dry sand. Not more than a tenth of the soil is cultivable. In the neighbourhood of the villages, which are situated mainly in the wadies, wheat, barley, &c., are cultivated. Camels and horses are reared in considerable numbers. Lions, leopards, hyænas, jackals, wild-cats, porcupines, vultures, ostriches, buzzards, &c., are found in abundance. The inhabitants are a mixed race, of a brown colour, in many respects resembling the negroes, but are generally well formed. The original inhabitants belonged to the *Berber* family, but since the invasion of the country by the Arabs in the 15th c., the traces of this native North African element have gradually become very faint. The language spoken is a corrupt mixture of Berber and Arabic. The people are far behind in civilisation, and occupy themselves with gardening and the manufacture of the most indispensable necessaries of life. Considerable trade is carried on by means of caravans between the interior of Africa and the coast. F. is the Phazania of the ancients, against which the Romans, under Cornelius Balbus, undertook a campaign about 20 B.C. During the classic period, as well as in the middle ages, it was governed by its own princes who were at first independent, but afterwards became tributary to the pashas of Tripoli. In the year 1842, F. was conquered by the Turks, and since that time has remained a Turkish pashalic. Murzuk, the capital of F., is a well-built town, with broad streets and a population of 2800. Merchandise to the value of £21,000 annually changes hands here, and of that amount the slave-trade forms seven-eighths. Murzuk is now the great starting-point from the north for the interior of Negroland. Compare Barth's *Travels in Central Africa* (Lond. 1857), and also the descriptions given of Fezzân by Denham, Clapperton, Oudney, Richardson, Dr Vogel, &c.

FIAR. See FEE AND LIFERENT.

FIARS (a word said by Jamieson to be of Gothic origin, and to exist in the same form in Icelandic). The *fiars* prices in Scotland are the prices of the different kinds of grain of the growth of each county for the preceding crop, as fixed by the sentence of the sheriff, proceeding on the report of a jury summoned for the purpose, before whom the evidence of farmers and corn-dealers is produced. The values thus officially ascertained serve as a rule for ascertaining the prices of grain in all contracts where they are not fixed by the parties; and in many sales it is agreed to accept the rates fixed by the fiars. Ministers' stipends, in so far as they consist of grain, and crown dues, are also paid by the fiars prices of the county for each year. With a view to the latter, fiars, in former times, were struck in exchequer. An error in striking the fiars will not afford a ground of suspension.

The form of procedure in 'striking the fiars,' as it is called, is regulated by Act of Sederunt, 21st Dec. 1723, renewed 29th February 1728. The time fixed by this act for summoning the jury is between the 4th and 20th of February, and the verdict must be returned before 1st March, old style; which is generally considered too early, as before that time not much grain of the previous crop has been brought into the market. Mr Barclay, sheriff-substitute of Perthshire, in his Digest, gives the following account of this difficult and delicate process as practised in his county. 'In Perthshire, the fiars court is held on the last Friday of February, or the first Friday of March. The jury consists of eight heritors, a few farmers, and some neutral parties, especially one or two able to check the calculations.

An experienced accountant is sworn, and acts as such, but is not on the jury, and is paid a fee from the county rates. The list of the jury is shifted every alternate year, thereby giving sufficient release from duty, and yet securing persons skilled in the practice. Some years ago, it was arranged to take no juror who either paid or received rents according to the fiars; but this greatly limited the choice, and was complained of, and abandoned. All considerable dealers in Perthshire victual, whether resident in Perthshire or elsewhere, are uniformly summoned, and in addition, every person whose name is given in by whatever person interested.' As grain is commonly sold according to weight, one shilling being generally allowed on wheat for every additional pound-weight on every bushel; on an application by the farmers, it was agreed to determine the classification by taking a certain weight as the point of division. The first thing which the jury do is consequently to determine the point of weight. The witnesses are then sworn to the schedules, which they receive after harvest, and in which they insert every separate quantity of grain sold, with the dates and prices divided into first and second classes, according as the judgment of each witness dictates, and the weight of each parcel. The results of the separate schedules are inserted by the accountant in a general schedule, which is summed up by the accountant, such members of the jury as are capable assisting him. The result constitutes the fiars prices for the year. The same mode is not adopted in England; but weekly averages of *all* grain sold at public markets are ascertained and published in the *Gazette*, and this is without respect to the produce of particular counties. 9 Geo. IV. c. 60; 5 and 6 Vict. c. 14; 9 and 10 Vict. c. 22. See *Historical Account of the Striking of the Fiars in Scotland*, by George Paterson, Esq., Advocate, 1852.

FIA'SCO, a term borrowed from the Italian theatre, and now naturalised in France and Germany, besides being occasionally used by English writers. It signifies a failure to please on the part of an actor or singer, and is thus the opposite of *furore*, although why the word, which simply means a bottle, should come to be thus applied, is more than anybody knows. In Italy, it is not uncommon to hear an audience cry out, '*Olà, olà, fiasco,*' even when the singer has only made a single false note.

FI'AT, in English Law, a short order or warrant of some judge for making out or allowing certain processes.

FIBER. See Musquash.

FI'BRE (Lat. *fibra*), a term of very common use as applied to objects of a stringy or thread-like character, whether of the animal, vegetable, or mineral kingdom. Minerals are often described as of a fibrous structure or appearance, in which there is, however, no possibility of detaching the apparent fibres from the general mass, or in which they are inflexible and brittle if detached: but a more perfect example of mineral fibre is found in *Amianthus*, a variety of Asbestus (q. v.). For the scientific use of fibre with regard to the animal kingdom, we refer to the article Muscle; for its scientific use with regard to the vegetable kingdom, to Vegetable Tissue and to Wood and Woody Fibre. In its more popular, but perfectly accurate use, it includes the hair or wool of quadrupeds, the silken threads of the cocoons of silk-worms and other insects, the fibres of the leaves and of the inner bark of plants, and the elongated cells or hairs connected with the seeds of plants, the ordinary materials of cordage and of textile fabrics.

Of mineral substances, amianthus alone has been used for textile fabrics, and that only to a very limited extent. Animal and vegetable fibres have, from the earliest ages, supplied man with cordage and with cloth. How the invention took place, can only be matter of conjecture.

The animal fibres used for textile purposes are chiefly of the two classes already mentioned—(1) the wool or hair of quadrupeds, and (2) the silk of the cocoons of insects. To these may be added (3) the Byssus (q. v.) of molluscs, but this class contains only the Byssus of the Pinna (q. v.) of the Mediterranean, an article of ancient and high reputation, but more of curiosity than of use. The skins and intestines of animals, although sometimes twisted or plaited for various uses, can scarcely be reckoned among the fibrous materials afforded by the animal kingdom. For information regarding the fibres obtained from the cocoons of insects, see Silk and Silkworm. It is to the first class that the greater number of different kinds of animal fibre used for textile purposes belong; and the wool of the sheep far exceeds all the rest in importance. See Sheep and Wool. But the wool or hair of other quadrupeds is also to some extent used, as of the Goat (see Goat and Angora), the Alpaca (q. v.), the Camel (q. v.), the Bison (q. v.), the Musk Ox (q. v.), the Yak (q. v.), and the Chinchilla (q. v.); all of which, except the last—and it has but a doubtful claim to be mentioned—are, like the sheep, ruminants. The hair of comparatively few animals is sufficiently long for textile purposes, or can be procured in sufficient abundance to make it of economic importance. The warmth of clothing depends much on the fineness of the hair, and on other characters in which wool particularly excels.

The useful vegetable fibres are far more numerous and various than the animal. They are obtained from plants of natural orders very different from each other; none of them, however, belonging to the class of acrogenous or cryptogamous plants. They are obtained also from different parts of plants. Those which are derived from exogenous plants are either the fibres of the inner bark (or Bast, q. v.), as flax, hemp, &c., or hairs of the fruit, as cotton. The useful fibres of endogenous plants sometimes also belong to the fruit, as coir or cocoa-nut fibre, and the unimportant fibre of cotton-grass. The spathe of some of the palms is sometimes also sufficiently fibrous and strong to be used for bags, &c., without separation of its fibres; the fibres of the interior of the stem of old cocoa-nut palms are sometimes used for coarse purposes; the fibrous character of the stems of the slender palms called rattans, of bulrushes, &c., fits them for wicker-work, for plaiting into chair-bottoms, and the like; the roots of the *Agaves* (q. v.) yield fibres useful for various purposes; but generally, the more valuable fibres obtained from endogenous plants are those of their leaves, either of the leaf-stalks—as Piassaba fibre and Gomuto or Ejoo fibre, both produced by palms —or of the blade of the leaf, as Pine-apple fibre, Pita Flax, New Zealand Flax, Bowstring Hemp, &c. The fibres of the leaves of endogens being parallel to each other, are easily obtained of sufficient length for economical purposes; whilst the reticulated fibres of the leaves of exogens, even if long enough, which is comparatively seldom the case, cannot be separated for use. The *bast* fibres of exogens, however, are often of sufficient length, and easily separable. Their separation is generally accomplished by steeping in water, or by frequent bedewing with water, so as to cause a partial rotting of the other parts of the bast and of the bark which covers it. But the fibres of endogens being in general discoloured and injured by this process to a much greater degree than those of exogens, mere mechanical means are usually preferred for their separation, such as beating, passing between rollers, and scraping. The fibres of many leaves are separated by scraping alone. The fibres of *fruits*, as cotton, exist in nature in a separate state, like the wool or hair of animals, and require merely to be collected and cleaned.

A complete enumeration of the kinds of vegetable fibre applied to economical purposes would not be easy. Flax, Hemp, and Cotton have long had the pre-eminence. To these have recently been added New Zealand Flax, Jute, Sunn or Sunn Hemp, Coir, Pita Flax, Abaca or Manilla Hemp, Bowstring Hemp, China Grass, Piassaba, and many others. New kinds are continually being brought under notice, and to this industrial exhibitions and industrial museums have most beneficially contributed. New kinds, however, do not immediately command the attention they deserve. 'If a new product is sent into the market,' says Dr Royle, 'few of the regular customers will buy it, as they want that to which their machinery and manufactures are suited.' But for the judgment and enterprise of Mr Salt, it might have been long ere alpaca wool had obtained its present place among the materials of our manufactures; and there is much reason to think that many vegetable fibres, now little regarded, may yet in like manner be exalted to importance.

For the use of vegetable fibres in the manufacture of paper, see PAPER.

FIBROUS PLANTS. Without attempting a complete enumeration of plants which yield fibres employed for economical purposes, we give the following as a list which may be useful. Many of the subjects will be found treated in separate articles, or more fully noticed under the natural orders. The most important are indicated by capitals.

I. EXOGENOUS PLANTS.

1. *Fibres of the Fruit.*

Nat. Ord. *Malvaceæ.* COTTON, produced by species of *Gossypium.*
——— *Sterculiaceæ.* Silk-cotton, or vegetable silk, the produce of *Bombax villosum*, &c.
——— *Asclepiadaceæ.* The silk-like down of the seeds of Virginian Silk (*Asclepias Syriaca*).

2. *Fibres of the Inner Bark or Bast.*

Nat. Ord. *Malvaceæ.* Deckanee Hemp (*Hibiscus cannabinus*).—Other species of *Hibiscus*, *Althœa cannabina*, *Sida abutilon*, &c.
——— *Sterculiaceæ.* A number of species of different genera; some of them cultivated to a small extent.
——— *Tiliaceæ.* JUTE (*Corchorus olitorius*, *C. capsularis*, &c.)—The bast of some trees of this family, as the Linden or Lime (*Tilia Europæa*, &c.) is used for mats, ropes, &c. See BAST.
——— *Linaceæ.* FLAX, the produce of *Linum usitatissimum.*
——— *Leguminosæ.*—SUNN, Jubbulpore Hemp, &c., the produce of species of *Crotalaria.*
Spanish Broom (*Spartium junceum*).
Bokhara Clover (*Melilotus arborea*).
Dhunchee (*Sesbania aculeata*).
Species of *Cytisus* (as Common Broom), Butea, *Parkinsonia*, *Bauhinia*, &c.
——— *Asclepiadaceæ.* Jetee (*Marsdenia tenacissima*).
Yercum or Mudar (species of *Calotropis*).
Virginian Silk (*Asclepias Syriaca*, *A. debilis*).
Other species of several genera.
——— *Apocynaceæ.* Canadian Hemp (*Apocynum cannabinum*).
Nat. Ord. *Urticeæ.* Common Nettle (*Urtica dioica*) and other species of *Urtica.*
Species of *Bœhmeria*, one of them yielding CHINA GRASS Fibre.
——— *Cannabinaceæ.* HEMP (*Cannabis sativa*).
Hop (*Humulus lupulus*).
——— *Moraceæ.* The bark of some species of Fig.
——— *Coniferæ.* Inner bark and roots of some species of Pine and Fir.
——— Unknown. Buaze.

II. ENDOGENOUS PLANTS.

Nat. Ord. *Liliaceæ.*
NEW ZEALAND FLAX, fibre of leaves of *Phormium tenax.*
Bowstring Hemp, fibre of leaves of species of *Sanseviera.*
Fibre of leaves of species of *Aloë* and of *Yucca.*
——— *Amaryllideæ.* Pita Flax, fibre of leaves of *Agave Americana.*
Fibre of leaves of species of Fourcroya.
——— *Musaceæ.* Abaca or Manilla Hemp, and Plantain Fibre, obtained from leaves of species of *Musa.*
——— *Bromeliaceæ.* Pine-apple Fibre, Curratow, &c., fibres of leaves of species of *Bromelia*, &c.
——— *Pandanaceæ.* Fibres of leaves of Screw-pines.
——— *Palmaceæ.* COIR or cocoa-nut fibre, from husk of cocoa-nut. Fibre of cocoa-nut stem. Gomuto or Ejoo fibre, from leaf-stalks of Gomuto Palm (*Arenga saccharifera*).
Piassaba, from *Attalea funifera* and *Leopoldinia Piassaba* (the Chiquichiqui Palm).
Other fibres from leaf-stalks, &c., of many palms.
——— *Cyperaceæ.* Fibre from leaves of *Eriophorum cannabinum* (see COTTON-GRASS). Mats, chair-bottoms, &c., made of different *Cyperaceæ.*
——— *Gramineæ* or Grasses. Esparto (*Stipa tenacissima*).
Moonja (*Saccharum munja*).

FI'BRINE is an organic compound, occurring both in animals and plants. In its chemical composition it closely resembles albumen and caseine, and it was until recently believed that these three substances possessed a common radical, to which the name *proteine* (from *proteno*, I am first) was given, the proteine being regarded as the primary basis of all the tissues of the body. Hence we frequently find fibrine described as one of the proteine bodies.

Fibrine is mainly distinguished from the allied substances, albumen and caseine, by its separation in a solid state, in the form of extremely delicate filaments or lamellæ, from any fluid in which it is dissolved, very shortly after the abstraction of the latter from the organism.

Animal fibrine, which is of the greatest physiological importance, occurs principally in the blood, the lymph, and the chyle. In order to obtain it in a state of purity, we beat or stir the blood with a bundle of twigs, to which the fibrine adheres in strings. The impure fibrine thus obtained is then rinsed with water, boiled with alcohol and ether, —to remove fatty matters—and dried. In healthy venous blood, it scarcely ever amounts to 3 in 1000 parts, its average quantity being 2·3. Small, however, as its amount is, it varies more than any other constituent of the blood, and in acute inflammatory diseases sometimes exceeds its average by five or six times. Moreover, arterial blood contains more fibrine than venous blood. In the lymph and chyle, it occurs in considerably less quantity than in the blood. In inflammatory exudations, we find fibrine in the contents of the serous cavities—as, for example, of the pleura and peritoneum—and on the mucous membrane (as in croup); in these cases, it usually occurs in a state of spontaneous coagulation.

There are good physiological reasons for believing that fibrine is formed from albumen, and not directly from the food; and as fibrine contains a little more oxygen than albumen, it has been inferred that it is formed from the latter by a process of oxidation. As, however, more fibrine is found in the blood in pneumonia—when a considerable portion of the lungs is rendered impervious to air—than in almost any other disease, we are inclined to adopt the opposite hypothesis, that the augmentation of the fibrine in inflammatory blood is caused by an insufficient supply of oxygen. When oxygen is abundantly introduced into the blood, the fibrine rapidly undergoes further transformations: on the other hand, when, in consequence of impeded respiration, the quantity of oxygen conveyed to the blood is not sufficient to effect the further normal oxidation or transformation of the fibrine, we have an accumulation of that constituent in the circulating fluid.

It has, however, been a disputed question, whether fibrine is produced in the elaboration or in the disintegration of the tissues. For the discussion of this subject, and of other points connected with fibrine, we must refer to Lehmann's *Physiological Chemistry*, vol. i. pp. 361—364.

The substance forming the mass of flesh or muscular tissue was formerly regarded as identical with coagulated blood-fibrine. The two substances are, however, chemically distinct, and the muscle-fibrine will be described under its new chemical name, SYNTONINE (from *sunteinein*, to contract or render tense).

FIBROUS TISSUE. See TISSUES.

FI'CHTÉ, JOHANN GOTTLIEB, an illustrious German philosopher, was born at Rammeau, in Upper Lusatia, 19th May 1762. His earliest years were marked by a love of solitary musing and meditation. When a mere child, he was wont to wander forth to upland fields, that he might enjoy the pleasure of gazing into the illimitable distance. In 1775, he was placed at the gymnasium of Pforta, near Raumburg; and in 1780 he entered the university of Jena, where he devoted himself at first to theology, but afterwards to philosophy. During the years 1784—1788, he supported himself in a precarious way as tutor in various Saxon families. Subsequently, he went to Zurich in a similar capacity, where he made the acquaintance of the excellent lady who afterwards became his wife, Johanna Maria Rahn. In 1791, F. obtained a tutorship at Warsaw, in the house of a Polish nobleman. The situation, however, proved disagreeable, and was thrown up by the fastidious philosopher, who next proceeded to Königsberg, where he had an interview with Kant, of whom he had become an ardent disciple. Here he wrote, in 1792, his *Kritik aller Offenbarung* (Critique of all Revelation), which he shewed to that philosopher, who praised it highly, but still maintained a certain air of reserve towards the enthusiastically earnest author, which pained the latter greatly. At Königsberg, F. was reduced to such straits for want of the means of subsistence, that he was forced to ask the loan of a small sum of money from Kant, which the latter was stoical enough to refuse. Things were now at the worst with F., and of course—according to the old adage—they began to mend. He entered the delightful family of the Count of Krokow, near Danzig, as tutor; was enabled to marry; and in 1794 was appointed to the chair of Philosophy at Jena, where he commenced to expound with extraordinary zeal his system of transcendental idealism. F., in fact, *preached* his philosophy as if he believed its reception essential to the salvation of his hearers. In 1795, he published his *Wissenschaftslehre* (Doctrine of Science), in which he clearly broke away from Kant, whose speculations did not seem to him sufficiently thorough, or, as Englishmen would say, *idealistic*. Indeed, as early as 1793, writing to Niethammer, he says: 'My conviction is, that Kant has only *indicated* the truth, but neither unfolded nor proved it.' An accusation of atheism, which F. fervidly but fruitlessly refuted, cost him his chair in 1799. In the previous year, he published his *System der Sittenlehre* (System of Ethics, Jena, 1798), considered by many to be his most mature work. He now removed to Berlin, where he delivered lectures on philosophy to a select auditory. In 1800, appeared his *Ueber die Bestimmungen des Menschen* (On the Destiny of Man). In 1805, he obtained the chair of Philosophy at Erlangen, with the privilege of residing at Berlin in the winter. Here he delivered his celebrated lectures, *Ueber das Wesen des Gelehrten* (On the Nature of the Scholar, Berlin, 1805—1806). In the same year, appeared his *Grundzüge des gegenwärtigen Zeitalters* (Characteristics of the Present Age); and in 1806, his *Anweisung zum seligen Leben oder die Religionslehre* (The Way to the Blessed Life, or the Doctrine of Religion). But F. was a patriot as well as a philosopher. The victories of Napoleon at Auerstadt and Jena drew forth the famous *Reden an die Deutschen* (Addresses to the Germans). These addresses were full of the most exalted enthusiasm. F. 'laments that his age has denied him the privilege accorded to Æschylus and Cervantes, to make good his words by manly deeds.' The Prussian king appreciated the zeal of the eloquent metaphysician, and, on the restoration of peace, requested him to draw up a new constitution for the Berlin University. In 1810, the university was opened, with a host of brilliant names, F., Wolff, Müller, Humboldt, De Wette, Schleiermacher, Neander, Klaproth, and Savigny. By the votes of his colleagues, F. was unanimously elected rector. Here, as at Jena, he laboured with unremitting energy for the suppression of all those customs which he deemed barbarous in themselves, and incompatible with the true idea of a scholar. In 1813, the war of independence broke out, and the hospitals of the Prussian capital were soon crowded with patients. F.'s wife was one of the first who offered her services as a nurse. For five months, she tended the sick with all the patient tenderness and devotion of her nature. At last, she was seized with fever, 3d January 1814. After a fearful struggle, she recovered; but her husband caught the infection, and in spite of all remedies, sank under its influence, and died 27th January 1814. It is difficult to speak calmly of Fichte. His life stirs one like a trumpet. He combines the penetration of a philosopher with the fire of a prophet, and the thunder of an orator; and over all his life lies the beauty of a stainless purity. See *Fichte's Leben und literarischer Briefwechsel* (published by I. H. Fichte, 2 vols. Sulzb. 1830—1831); and W. Smith's *Memoir*, published by Chapman and Hall (Lond. 1848). The fundamental notion of the idealism set forth in F.'s writings, at least in the earlier of them, is the sole reality of the *Ego* or I, which posits both itself and the *Non-ego*, or Not-I. (The phrase 'to posit,' it ought to be observed here, signifies in German metaphysics, to present to the consciousness. Hence, when it is said that the *ego* posits itself, the meaning is, that the ego becomes a fact of consciousness, which it can only become through the antithesis of the *non-ego*.)

Under this ego, however, must not be understood, according to the usual misapprehension, the human and finite, but the 'absolute subject-objectivity' (*absolute subject-objectivität*), the eternal, universal reason. The ego is the absolutely productive, which, however, would not attain to consciousness of itself—i. e., of its infinite spontaneous activity, did it not at the same time place in contrast to itself, and as an impediment (*anstoss*) and limit to its activity, the non-ego—i. e., the objective world, or nature. The ego, in so far as it is determined by the non-ego, is the intelligent ego, and, as such, the subject of theoretical science; the ego, on the other hand, as determining the non-ego, is the subject of practical science. Freedom, absolute, spontaneous activity, for its own sake, is not with F., as with Kant, the condition and pre-supposition of moral action, but is itself the highest expression of the problem of the moral law. To realise this self-activity, however, the ego requires an external world of objects, in order that in them as limits it may become conscious of its own activity. To this idealistic system of ethics it has been plausibly—some think unanswerably—objected that it makes the non-ego be required as the condition of morality, and at the same time represents the removal of this condition as the aim of moral effort. With respect to the idea of right, F.'s theory of freedom, in its fundamental principles, attached itself to the Kantian theory of freedom as the innate and primitive principle of right. Generally speaking, F. makes that which, from the stand-point of ordinary consciousness, we call the world, merely a product of the ego; it exists only through the ego, for the ego, and in the ego. F. himself afterwards modified or extended his system, so as to bring out more prominently the *theistic* character of his metaphysics. The transition to this later stage of F.'s philosophy is seen in his *Bestimmung des Menschen* (Destination of Man). It arose from the intense religiosity of his nature. F. was essentially a worshipping nature, and though he never ceased to be a philosopher, the untiring aspiration of his later years was to realise in his own way the belief of the great Jewish lawgiver: 'The eternal God is thy refuge, and round thee are the everlasting arms.' A popular exposition of his philosophy is given in his *Anweisung zum seligen Leben.* It is set forth in a strictly scientific manner in the lectures published in the *Nachgelassenen Werke*, edited by I. G. Fichte (3 vols. Bonn, 1834—1835), in which his *Speculative Logik* and his revised theory of right and morals are particularly deserving of attention. Although F. never, strictly speaking, formed a school, and though his system has only been adopted by a few, such as J. B. Schad, Mehmel, Cramer, Schmidt, and Michaelis, his influence upon the subsequent development of German philosophy has been very important. F.'s collective works have likewise been published by his son, I. H. Fichte. His popular works have been translated into English by W. Smith, and published by J. Chapman of London in his 'Catholic Series.' Their titles are—*The Destination of Man, The Vocation of the Scholar, The Nature of the Scholar, The Way to the Blessed Life*, and *The Characteristics of the Present Age.*

FICHTE, Immanuel Hermann, son of the former, and professor of philosophy in the university of Tübingen, was born in 1797, and early devoted himself to philosophical studies, being attracted by the later views of his father, which he considers were essentially *theistic.* He also attended the lectures of Hegel, but felt averse to his pantheistic tendencies, and leaned more to Schleiermacher and Schelling. Occupied at first as a teacher, F. was appointed professor of philosophy in Bonn in 1836, and in 1842 received a call to the university of Tübingen. His chief works are—*Beiträge zur Characteristik der neuern Philosophie* (1841), *Grundzüge zum Systeme der Philosophie* (Heidel. 1839—1847); *System der Ethik* (Leip. 1850—1851), and *Anthropologie, oder die Lehre von der Menschlichen Seele* (Leip. 1856). He suggested meetings of philosophers similar to those held by physicists; and at the one held at Gotha, 1847, he delivered an address *On the Philosophy of the Future* (Stuttg. 1847). The great aim of his speculations has been to find a philosophic basis for the personality of God, and for his theory on this subject he has proposed the term *Concrete Theism*, to distinguish it alike from the abstract theism which makes God almost an unreality—a barren aggregate of lifeless attributes; and on the other hand, from the all-absorbing pantheism of Hegel, which swallows up the human and the divine in its own inapprehensible totality. Recently, F. has published an important work, *Zur Seelenfrage, eine Philosophische Confession*, which has been translated into English by J. D. Morell, under the title of *Contributions to Mental Philosophy* (1860), for an account of which see art. Consciousness. During the movements of 1848, he issued several political tracts. The principle of F.'s politics is not unlike Dr Arnold's maxim. He holds that there is only one kind of real conservatism, that of constant well-planned reform; and that all revolution consists either in attempts to precipitate prematurely the future, or to go back to ideas that are effete, the last being only the chrysalis form of the first. The state, 'according to the idea of benevolence,' belongs to the future. The regeneration of Christianity would consist in its becoming the vital and organising power in the state, instead of being occupied solely, as heretofore, with the salvation of individuals. To this recent school of philosophy belong Weisse, Chalybœus, Wirth, and others.

FICI'NO, Marsilio, an illustrious philosopher of the Italian Platonic school, was born at Florence 1433. He was the son of the principal physician of Cosmo de' Medici; and to the liberality of this prince he owed the classical culture which inspired his future career. At the suggestion of Cosmo, F. undertook the translation of Plotinus, Jamblichus, Proclus, and Porphyry, besides a Latin but by no means literal version of Plato. In 1463, he was appointed by Cosmo president of a classical society or academy, founded in 1440, having for its aim the diffusion of the Platonic doctrines, which F. held to be the basis and confirmation of the Christian system. On the death of Cosmo, F. found a no less munificent patron in this prince's grandson, Lorenzo de' Medici; and having, at the mature age of 40, decided on entering the church, he was endowed by Lorenzo with the rectorship of two churches in Florence, and a canonry in the cathedral. His theological doctrine, while undoubtedly sincere, presents a strange medley of incongruous views, the natural result of his attempt to fuse the philosophy of Plato with the Christian creed. He died in 1499, and was interred in the cathedral of Florence, where a monument commemorates his upright and manly qualities no less than his learning and philosophy. F.'s collected works were published at Basel (2 vols. f. 1491), and consist of translations from the Greek philosophers, and original metaphysical and theological compositions, of which we may mention the *Theologica Platonica, De Religione Christiana*, his Latin epistles, and a Commentary on the Epistles of St Paul.

FICTION. See Novels and Romances.

FICTION OF LAW has been defined to be 'a supposition of law that a thing is true, which is either certainly not true, or at least is as probably false as true.'—Erskine, *Inst.* iv. 2, 38. Fictions have existed in all legal systems. They must be regarded as a species of legal fraud, which has been tolerated as enabling individuals who, by the strict letter of the law, would have been excluded from obtaining redress of evils, to procure that remedy by a pious fraud. There are two general maxims which regulate the application of fictions—viz., that no fiction shall be allowed to operate a wrong, and that no fiction shall be admitted which in the nature of things is impossible. The Roman form of judicial procedure abounded with fictions, by which alone, in many cases, a party aggrieved could enforce his right. Thus, an heir, unjustly disinherited, by the *querela inofficiosi testamenti*, feigned that his father had been mad. A stranger in Rome, who had been robbed, could not obtain restitution without the *fictio civitatis*, whereby he feigned himself a citizen. Many of the fictions existing in Rome have found a counterpart in modern systems; thus, the *fictio longœ manus*, whereby lands at a distance were feigned to be delivered, resembles an English feoffment at law. In like manner, the *fictio traditionis symbolicœ* of keys of a warehouse to give possession of the articles contained therein, and of a deed in confirmation of the covenants contained therein. The *fictio unitatis personarum* was the original of the Scottish fiction, that the heir is *eadem persona cum defuncto*. But in no system of laws have fictions been so liberally adopted as in that of England. It is by means of fictions alone that the original limited jurisdiction of the courts of Queen's Bench and Exchequer has been extended to ordinary suits. In the latter court, every plaintiff assumed that he was a debtor to the crown, and was debarred from discharging his obligation by the failure of the defendant to satisfy his demand; in the former, it was assumed that the defendant had been arrested for some supposed trespass which he had never in fact committed. The fictitious characters of John Doe and Richard Roe long contributed to make the action of ejectment famous. And though these fictions have disappeared before the ruthless hand of modern legislation, yet to this day, in an action at the instance of a father for the seduction of his daughter, damages can only be awarded on the assumption that she was his servant, and that he has suffered pecuniary loss by deprivation of her services. In Chancery, again, the whole doctrine of uses and trusts is based upon a fiction. Perhaps the best explanation of the introduction of fictions into legal systems is to be found in Dr Colquhoun's *Summary of the Roman Civil Law*, 2027. It involves, he says, 'less difficulty to adhere to known and admitted forms, and gradually to accommodate them to the changed state of society, than to upset all the incidents connected with them by a sudden change, which must ever tend to unsettle the law and practice of the courts. All nations have therefore found it more desirable to let the one glide into the other, than to adopt any abrupt measure which might disturb the practice and effect of former decisions.'

In the law of Scotland, fictions of law are not of frequent occurrence. For the benefit of creditors, the principle that the heir is *eadem persona cum defuncto* is admitted; and in an action of 'Reduction-improbation' of a deed, it is assumed that the document was false, whether the fact be so or not. But in general the legal system of Scotland has shewn a facility of adapting itself to the circumstances of the case, and that without producing the alarming results which presented themselves to the imagination of Dr Colquhoun.

FICUS. See Fig.

FID (from the Lat. *findere, fidi*, to divide), for splicing ropes, is a large pointed pin, with an eye at the thick end, of iron or lignum vitæ, used by sailors in separating and interlacing the strands of which the rope is composed.

A *mast-fid* is a bolt inserted through the bottom of a ship's topmast or top-gallant-mast, with ends resting on the trestle-trees sustained by the head of the lower mast or topmast. Unless the mast-fid be withdrawn, the supported mast cannot be lowered.

FIDDEMIN, one of the handsomest villages of the Fayûm, inhabited by a Mussulman and Coptic population. It is surrounded by fruit trees, and is remarkable for a large olive, supposed to be the original one planted in Egypt, and yielding annually 268 pounds of olives.—Clot Bey, *Aperçu générale sur l'Egypte* (8vo, Paris, 1840), vol. i. p. 213.

FIDDLE. See Violin.

FIDEICOMMISSUM, in the Civil Law, was a conveyance of property in trust to be transferred to a third person named by the truster. *Fideicommissa*, when first introduced, were not supported by the law. The performance of them depended, therefore, on the conscience of the party intrusted, and they were consequently frequently not carried out. They were originally adopted for the purpose of conveying property either where a party, from the circumstances of the case, as inability to procure the proper number of witnesses, was prevented from executing a will; or where he desired to benefit those who, by law, were precluded from taking the property. To effect this purpose, an actual conveyance was made to a friend, coupled with a request that the property should be transferred to another. Fideicommissa having thus been introduced for a special purpose, were by degrees extended to conveyances of the whole inheritance, and finally were used for the purpose of settling estates in a particular order of succession, forming the earliest instance of Entails (q. v.). Fideicommissa first received the sanction of positive law in the reign of Augustus, by whom authority was given to the prætor to enforce the performance of these fiduciary obligations.—*Institutes*, ii. 23, s. 1. The Emperor Claudius subsequently extended this authority to the consuls and presidents of provinces. Fideicommissa were either *particular* or *universal*, the former being a bequest of a particular subject, or a part only of the inheritance; the latter comprehended the whole estate.

In *Holland*, the principles of the civil law as to fideicommissa form an important branch of the law in regard to landed estates. An heir may be required to transfer either the whole or a portion of his inheritance. The provisions of the Senatus-Consultum Trebellianum also have been adopted; but if an heir resist the intentions of the testator, and is compelled by law to execute the trust, he is not allowed to take the benefit of these provisions. The benefit also may be excluded by express direction in the will. Children who have received their legal portions, and are required to transfer to a stranger the rest of the inheritance, are entitled to retain a fourth part for themselves. Grotius, *Dutch Jurisprudence*, by Herbert, b. ii. c. 20.

FIDI'CULA, a small musical instrument in the shape of a lyre.

FIEF. See Feudal System.

FIELD. In Heraldry, the field is the whole surface or continent of the escutcheon or shield. It is so called, according to some, because it represents the field of battle on which the achievements or charges represented on it are supposed to have been gained. In blazoning, the tincture or metal of the field must be the first thing mentioned.

FIELD-ALLOWANCE, a daily allowance granted to officers of the British army in consideration of extra expense entailed upon them in consequence of military operations. *Ordinary* field-allowance, ranging from £1, 10*s.* for a general officer to 1*s.* for a subaltern, is applicable when troops are encamped at home or in the colonies. *Extra-ordinary* field-allowance is sanctioned when and wherever troops are engaged in actual warfare; it ranges for the above ranks from £2, 10*s.* to 1*s.* 6*d.* Strict rules are laid down that no officer shall receive this allowance unless positively present with the army.

FIELD-GLASS, is the lens usually interposed between the object-glass and eye-glass of a microscope, which, receiving the diverging rays from the former before they form an image, contracts the dimensions of the image, and increases its brightness, so as to render it of a proper size and degree of distinctness for being viewed by means of the eye-glass. See FIELD OF VIEW, and MICROSCOPE.

FIELD-MARSHAL, the highest rank of general officers in the British and some foreign armies. In the former, it is a special honour enjoyed by very few officers, and only conferred by selection, either on the ground of distinguished service or of royal birth. When unemployed, the field-marshal has no higher pay than any other general, but if commanding an army, he receives £16, 8*s.* 9*d.* a day for staff-pay, while a general has but £9, 9*s.* 6*d.* The equivalent rank in the navy is that of admiral of the fleet. Formerly, a captain-general was occasionally appointed, who had rank higher even than a field-marshal.

FIELD-MOUSE, a name popularly given to certain species both of MOUSE and of VOLE. See these articles.

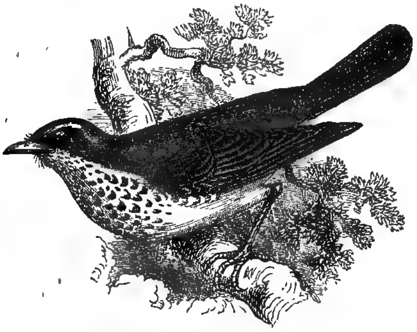
FIELD-OFFICERS, in the Army, are such as are competent to command whole battalions—viz., majors, lieutenant-colonels, colonels—in contradistinction to those merely intrusted with company duties, as captains, lieutenants, and ensigns.

FIELD OF VIEW is the whole space within which objects can be seen through an optical instrument; more strictly, it is the space within which the image of an object may be seen by whole pencils. That part of the image which is seen by partial pencils of the light from the object speculum or lens is called the *ragged edge*, and usually a diaphragm is employed to cut it off from the view of the observer altogether.

FIELD-TRAIN, a department of the Royal Artillery, consisting of commissaries and conductors of stores, responsible for the safe custody of the ammunition, for the formation of proper depôts of shot, &c., between the front and the base of operations, and that a due proportion shall be constantly at the service of each gun during an engagement.

FIELD-WORKS are intrenchments and other temporary fortifications thrown up by an army in the field, either as a protection from the onslaught of a hostile force, or to cover an attack upon some stronghold. Field-works will be more particularly described under the article FORTIFICATION (q. v.).

FIELDFARE (*Turdus pilaris*), a species of Thrush (q. v.), in size about equal to the blackbird, but with greater length of wing; the general colour gray, the feathers tipped with a brownish black elongated spot; the throat and breast reddish yellow, streaked and spotted with black; the forepart of the back and wings of a rich brown colour; the tail slightly forked and nearly black; the under parts white. The F. is a very common winter visitant of Britain, although it rarely breeds even in the northern parts of the island. It arrives from more northern regions when the winter has fully come, and departs again towards the end of spring. It is well known to youthful sportsmen, and affords much employment for their guns during the Christmas holidays, when it may generally be found in small flocks—often along with its smaller congener, the redwing—in fields, if the weather is mild, feeding on worms, snails, &c., or, in severe weather, about hedges, thickets, and woods, wherever haws and other such fruits or seeds are abundant. Its winter migrations extend southward as far at least as the islands of the Mediterranean. It is one of the summer songsters of the north of Europe and of Siberia; its song is soft and melodious, but is much less familiar to us in Britain than its call-note, which is harsh. It is extremely plentiful in Norway, where its nests are very generally built in spruce firs, and, contrary to the ordinary habits of thrushes, in society; numerous nests being often to be found in the same tree, and 'two hundred nests or more being frequently seen within a very small space.' The F. is easily tamed, and sings well in captivity.



Fieldfare (*Turdus pilaris*).

FIELDING, HENRY, born April 22, 1707, was the son of General Edmund Fielding, connected with the Earls of Denbigh. He was sent to Eton, and was afterwards transferred to the university of Leyden, to prosecute legal studies. Returning to London, he began to write for the stage, and worked with so much industry that between 1727 and 1736 he produced nearly a score of comedies and farces, which were forgotten with nearly as much speed as they were produced. He married in 1736, and falling heir to a small estate, he, with his young wife, retired from London. But his was not a Fortunatus's purse, and his hand was continually in it; and in three years after his marriage, he was back in London a student at the Temple. He was called to the bar at the usual time, but gout intervening, steady practice was rendered impossible. Happily, a way of escape was at hand. Richardson published *Pamela;* the town was ringing with it; and F., whose strong, healthy, unconventional nature revolted from the moral priggishness of 'Virtue Rewarded,' resolved to write a counterpart, purporting to be the adventures of Pamela's brother, *Joseph Andrews.* This work, begun in a satirical mood, and intended merely to quiz Richardson, deepened as it proceeded, and flowered out into humorous adventure. The exquisite character of

Parson Adams took the world by surprise, and remains one of the permanent glories of English fiction. The next important work undertaken by him was *Jonathan Wild*, a master-piece of irony, which has never been sufficiently appreciated, and which doubtless suggested to Mr Thackeray the scope and conduct of *Barry Lyndon*. The rebellion of 1745 induced F. to undertake the direction of the *Jacobite Journal*, in support of the Hanoverian succession; and shortly after, as a reward for his loyalty, he was, through the influence of Lord Lyttelton, promoted to a pension, and to the place of justice of the peace of Middlesex and Westminster. While engaged in magisterial duties, he produced *Tom Jones*, his most famous fiction, which the world has never ceased to read, nor critics to admire. His next work was *Amelia*—less striking and masterly than its predecessor, but quieter in style, and enriched with scenes of domestic tenderness. Shortly after its publication, he was attacked by dropsy, jaundice, and asthma, a complication of disorders which baffled the skill of the physicians. Seeking relief, he left England for Lisbon on the 26th June 1754, and died there on the 8th October of the same year, at the early age of forty-seven.

F. was the first great English novelist, and he remains to this day one of the greatest. *Tom Jones* is a miracle of invention, character, and wit. It contains the most amusing scenes and adventures, the most sparkling delineations of life, high and low, the most abundant satire. Everywhere, the author's manliness, shrewd sense, and scorn of meanness and hypocrisy, are apparent. If defects may be hinted, it may be said that F.'s nature was more robust than delicate; that it was deficient in the sentimental and poetic side; and, as a consequence, that his ideal of woman is not high, and his descriptions of the tender passion either commonplace or extravagantly rapturous. The love-scenes between Tom and Sophia, and the episode of the 'Man of the Hill,' which is meant to be passionate and poetic, are perhaps the only portions of the great novel which readers skip. It is to be regretted that all F.'s works are disfigured by coarseness of circumstance and expression; but that was the fault of the time as much as of the man. He was coarse, as he wore ruffles, drank claret, and hated the Pretender. He set himself to paint society as he saw it, and we must forgive the coarseness for the truthfulness of the picture.

FIELDING, Copley Vandyke, an English painter in water-colours, was born about 1787, and began to exhibit in 1810. For many years he held the office of President of the Society of Painters in Water-colours, and was generally recognised as the representative of that branch of art in England. He died at Worthing, in Sussex, March 3, 1855, in his 68th year, and after a career of steady prosperity. Possessing remarkable mechanical dexterity and knowledge of effect, F. painted with what severe critics would call fatal facility. He contributed about a score of pictures annually to the exhibition of the Water-colour Society. But, to do him justice, he always exhibited a certain easy finish of treatment, which was perhaps of itself a kind of secondary talent. Although his range of subjects was but limited, yet within it he was almost unrivalled. As a painter of marine effects, and of the landscapes of down and glade, it is thought by many that he has had as yet no equal.

FIERDING COURT (Fierding Thing), a district court in use among the early Gothic nations. This court was established for the purpose of rendering speedy justice in small matters. There were four of these courts in every hundred, each presided over by a separate judge, whose jurisdiction extended to all causes where the matter in dispute did not exceed the sum of three marks. Stiernhook, *De Jure Goth.* lib. i. c. 2.

FI'ERI FA'CIAS, Writ of, an English writ for enforcing the judgment of a court of law against the goods of a debtor. It may be sued out as soon as final judgment has been signed, or, in case of a trial out of term, in fourteen days after verdict, unless, on special cause shewn, a judge order speedy execution. But a writ of fieri facias cannot be enforced after a *Capias ad satisfaciendum* (q. v.) has been issued. The sheriff, in executing this writ, may not break open doors; but having obtained peaceable entrance, he may break open inner doors, cupboards, and trunks. The officer in execution having taken possession, may leave an assistant in charge, by whom an inventory of the goods is made. He is entitled to remain on the premises a reasonable time, in order to remove the goods; but if he continue longer without permission of the owner, he is liable to an action for trespass. By 8 Anne, c. 14, if goods are removed from land or premises let on lease, the party removing them must pay the rent and taxes. A creditor may not take, in execution, manure, hay, &c., where, by the covenants of the lease, the tenant is prohibited from removing them (56 Geo. III. c. 50). Growing crops, if seized in execution, and sold, are liable for rent accruing after the date of the seizure, as long as they remain on the ground (14 and 15 Vict. c. 25). By 1 and 2 Vict. c. 110, money, bank-notes, bills of exchange, and other securities, may be taken under a writ of fieri facias. By 8 and 9 Vict. c. 127, a creditor is not entitled to take wearing-apparel and bedding or tools where the value of the whole does not exceed £5. Such fixtures as belong to the heir, and not to the executor, cannot be taken under this writ. The goods of the party only who is named in the writ may be seized; and if the officer take goods belonging to a stranger, he is liable to an action for damages. By 1 and 2 Vict. c. 110, decrees and orders in Chancery have the effect of a judgment in a court of law, hence, fieri facias and other common law writs proceed upon the former as well as the latter.

Fieri facias de bonis ecclesiasticis is a writ directed to the bishop of the diocese, requiring him to attach the ecclesiastical goods of a clergyman within his diocese, in satisfaction of the judgment of a court of law.

FIE'SCHI, Count Giovanni Luigi, a member of one of the most illustrious Houses of Genoa, was born about the year 1523. In addition to the lustre of ancestral fame, his name has attained a tragic historical celebrity in connection with a remarkable conspiracy of which he was the chief. Andrea Doria, a famous admiral, sprung from a race hereditarily at feud with that of F., having expelled the forces of Francis I. from the state, had restored the republican form of government, but at the same time, by his vigorous administration, effectually held in check the ambition of the nobles. Count F. organised a plot, having for its object the death of Doria, and his nephew Gianettino, the object of F.'s special hatred, and the establishment of an oligarchic form of government. Instigated by the approval of France and Rome, and supported by an alliance with the Duke of Parma, F. speedily enrolled a formidable array of accomplices, his three brothers among the foremost. Crowds of his own feudal retainers were secretly armed and assembled from the various hereditary lands of the House; three galleys, purchased with the connivance of the pope, were fully equipped, and all being in readiness, the attempt was fixed for the 2d of January 1547. Doria, in spite of repeated warnings, refused to ascribe treacherous or subversive designs to F., whom he regarded as a fast friend and partisan. Complete success seemed at first to crown the conspirators; the gates of the city were forced, the fleet captured, Gianettino assassinated, Doria in flight. F. had but to appear and dictate, but he was nowhere to be found; and the strangest episode of this wild drama is the sudden disappearance of its hero. In stepping from one galley to the other in the darkness of night, F. stumbled, and falling overboard, was borne down by his ponderous armour, and miserably drowned in the harbour, or, according to some, stifled in the slime.

FIESCHI, Joseph Marco, known by his attempt on the life of King Louis Philippe, was born in Corsica in the year 1790. His early life contains nothing of note. A profligate career appears to have reduced him to great poverty about the year 1835, when he conceived the idea of assassinating the king. The immediate cause of his diabolical design was the suppression of a situation which he held, by order of the prefect of the Seine. Disguising his crime under the cloak of political enthusiasm, he leagued with himself one or two obscure persons, of pothouse politics, who hated the government of the Citizen King. These were Pierre Morey, a saddler; Pepin, a grocer; and Victor Boireau, a maker of lamps. F. sketched the plan of an infernal machine with twenty barrels, that could be simultaneously discharged; got one made, and placed it in a house of the Boulevard-du-Temple. The review of the National Guard held there, 28th July 1835, afforded F. the opportunity he desired. On the approach of the king and queen, he fired his machine. Eighteen people were killed, among whom was Marshal Mortier, who fell dead beside his sovereign. Louis Philippe, however, himself escaped with a mere scratch, and was able to continue the review. F. was immediately seized, and along with his accomplices, was tried, condemned, and executed, 16th February 1836.

FIE'SOLE (anciently, *Fæsulæ*), one of the most ancient Etruscan cities, is situated on the crest of a hill, at about three miles' distance from Florence, of which it may be said to be the parent city. From the heights of F., the view presented by Florence and the neighbouring valleys is gorgeous in the extreme. We find F. first mentioned in 225 B.C. during the great Gaulish war. Hannibal encamped here after crossing the Apennines. The city was next destroyed by Sulla in the Social War (90—89 B.C.), who afterwards despatched thither a military colony. At the invasion of Tuscany by the Goths, F. also fell under their dominion, and being by nature and art a formidable stronghold, was numerously garrisoned by the barbarians. The growth of Florence during the middle ages gradually reduced it to insignificance. It is now a place of about 2500 inhabitants. The only vestige of Etruscan structures still remaining is the cyclopean city wall, constructed of huge blocks of stone, many portions of which are wonderfully perfect. The site of the Etruscan fortress is now occupied by a convent, and interesting fragments of the foundations are often brought to light. The amphitheatre and other remains belong to the Roman age. The very ancient church of St Alexander, supposed to have originally served as a pagan temple, contains an altar dedicated to Bacchus, the inscription of which is, however, illegible, owing to a fissure in the middle. Coins and other relics have been repeatedly dug up.

FIESOLE, Fra Giovanni da, one of the most eminent regenerators of Italian art, also known by the title of *Il beato Angelico*, was born at Mugello in 1387. In 1407, he entered the Dominican order, and, together with his brother, consecrated his artistic abilities exclusively to sacred aims, illustrating various works of devotion with beautiful miniature designs. These early artistic efforts are remarkable for their rich effects of colouring, gorgeous illumination, and exquisite elaboration of the most minute ornamental details. Having achieved a high reputation as fresco-painter by some noble compositions with which he endowed his own and other convents, he was commissioned by Cosmo de' Medici, with the decoration of the church of Santa Annunziata and the convent San Marco. Each cell of the convent was adorned with a fine fresco of large dimensions, and amidst other paintings, one can still distinguish F.'s 'Annunciation.' The fame of this work induced Pope Nicholas V. to summon him to Rome, and intrust him with the execution of a series of illustrations taken from the life of St Laurence, destined to embellish the private chapel of St Laurence in the Vatican. See Giangiacomo Romano, *Le Pitture della Cappello di Nicolò V.*, &c. (Rome, 1810). So rigid a disciplinarian was F., that no private or public work was ever undertaken without the formal consent of his superiors being obtained, and to them all pecuniary remuneration was transferred. The archbishopric of Florence, spontaneously offered him by the pope, was humbly declined. He died in Rome in 1454. The gallery of Florence possesses several pictures of F., still undimmed in brilliancy of colouring. One of these, the 'Birth of John the Baptist,' is a conception full of simple and winning grace. Some of the largest easel-compositions of this artist at present adorn the gallery of the Louvre; among those in the antechamber are the 'Coronation of the Virgin,' and the 'Miracles of St Dominico.' One supreme aim pervades all the creations of F.—that of arousing lofty devotional feeling through the contemplation of the beautiful in art.

FIFE, an ancient wind-instrument of military music, in which the melody is produced by blowing through a hole in a reed or tube, while the escape of air is regulated by the fingers stopping or opening a number of other holes in different parts of the pipe. It has a compass of two octaves, from D on the fourth line of the treble clef to D above in altissimo. The fife figures in the sculptured memorials of the Argonautic expedition, and from that time to this has maintained its place as a simple yet effective instrument for martial purposes. It was common with English troops till the reign of James I., but was then discontinued; to be re-introduced by the Duke of Cumberland at the siege of Maestricht in 1747. It is a universal favourite in the navy, and many a stirring air on drums and fifes has cheered the British sailor to deeds of daring.

In the infantry, there is a *fifer* to each company, and a fife-major to each battalion, the former receiving the daily pay of 1*s.* 1*d.*, the latter, who is a non-commissioned officer, 2*s.*

FIFE-NESS, a promontory of Scotland, the eastmost point of Fifeshire, in lat. 56° 17′ N., and long. 2° 35′ W. On the north, in the sea, are the dangerous Carr Rocks, with an iron beacon 35 feet high, which required six years to construct. F. is in view of the Isle of May and Bell Rock lights. In the Ness, trap rocks jut through the carboniferous strata, and the rocks contain small caves.

FIFESHIRE, a maritime, almost peninsular county of the east of Scotland, between the Firth of

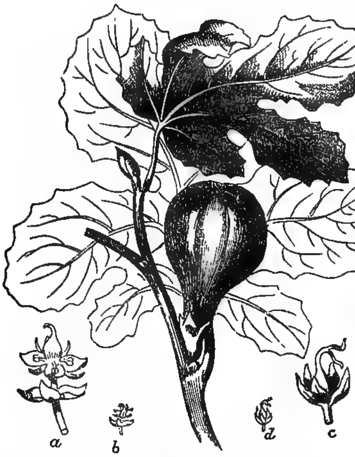
Forth on the south and the Firth of Tay on the north. It is 44 miles in extreme length from north-east to south-west, and 18 at its greatest breadth; area, 503 square miles; coast-line, 85 miles, mostly rocky, and having many good ports. The surface is a succession of cultivated vales and hills. The hills rise in the West Lomond, 1713 feet, and Largo Law, 1020. The chief rivers are the Tay, Forth, Eden (20 miles long), and Leven (12). F. rests on old red sandstone, with trap rocks in the north, and carboniferous strata, with trap, in the south. There are many coal and iron mines, and lime quarries. The climate is dry, healthy, and mild on the Forth; but the valleys in the north are much exposed to the full sweep of the east and north-east gales. The soil is a rich loam, or wet clay on till. The Howe of Fife, on the Eden, is mostly sandy and gravelly, and not very productive. In 1857, six-sevenths of the surface were in crop, the chief crops being oats, wheat, barley, turnips, flax, and beans. F. has a greater number of proprietors, gentlemen's seats, and plantations, in proportion to its size, than any other Scotch county, and its coasts are thickly studded with towns and villages. The chief manufactures are linen, sea-salt, and malt liquors. The chief exports are coal, lime, and fish. F. contains 61 parishes. Pop. (1861) 154,555. In 1851, there was a population of 153,546; 219 places of worship (77 Established Church, 49 Free, 45 United Presbyterian); 397 public day schools, with 23,145 scholars. It returns one member to parliament. The chief towns are Cupar, the county town, Dunfermline, St Andrews, Kirkcaldy, East and West Anstruther, Burntisland, Crail, and Dysart. The ancient 'Kingdom of Fife' was the most cultivated, as well as the most warlike, of Scotch counties. It contains striking monastic, feudal, and palatial ruins at St Andrews, Dunfermline, Falkland, and Lindores; many Celtic and Roman remains. Many of the events connected with the Scottish Reformation took place in this county, especially at St Andrews.

FIFTEENTH, a stop in English organs tuned two octaves above the diapasons, the lowest C pipe of which is two feet long.

FIFTH MONARCHY MEN. Among the strange and whimsical forms of opinion which the religious and political fermentation of the 17th c. brought to the surface of society, and embodied in the shape of religious sects, were those of the Fifth Monarchy Men. The date which has been assigned to their first appearance is 1654. Notwithstanding the ridicule with which they have often been overwhelmed, there seems nothing in their tenets more objectionable than we find in those of many of the other sects of the period, and there is no reason to believe that the practices of their leaders exceeded in absurdity, or equalled in impiety, those of Robbins, Reeve, Muggleton, and other apostles of the Ranters. In common with most persons who hold the literal interpretation of prophecy, they believed in the four great monarchies of Antichrist marked out by the prophet Daniel; and quite consistently with Christian orthodoxy, they added to them a *fifth*—viz., the kingdom of Christ on earth. So far, there was nothing peculiar in their views. But their error was twofold. 1*st.* They believed in the immediate, or at least in the proximate, advent of Christ (a tenet which was common to them with the early church); and 2*d.* They held that the fulfilment of God's promise to this effect must be realised by the forcible destruction of the kingdom of Antichrist. Every obstacle which opposed itself to the setting up the Messiah's throne was to be thrown down, and what these obstacles were was a question for the solution of which the only criterion which presented itself was their own fanatical prejudices and hatreds. It is obvious that such doctrines in such times must have given rise to practical as well as speculative disorder. The Fifth Monarchy Men became extinct as a sect shortly after the Restoration; a fact which, by depriving them of exponents of their own body, may have exposed them to misrepresentation (Marsden's *History of the Later Puritans*, p. 387). In politics, the Fifth Monarchy Men were republicans of the extremest section; and when their conspiracy to murder the Protector, and revolutionise the government, was discovered in 1657, their leaders, Venner, Grey, Hopkins, &c., were imprisoned in the Gate House till after the Protector's death. Amongst their arms and ammunition which was seized, was found a standard exhibiting a lion couchant, supposed to represent the lion of the tribe of Judah, with the motto, 'Who will rouse him up?'—Niel's *Puritans*, vol. iv. p. 186. See also Carlyle's *Cromwell's Letters and Speeches*, vol. iii. p. 31.

FIG (*Ficus*), a genus of trees and shrubs belonging to the natural order *Moraceæ*, and distinguished by having the flowers—male and female mixed—within an almost closed top-shaped fleshy receptacle, which enlarges to form the fruit, and encloses numerous one-seeded carpels, imbedded in its pulp. There are more than 100 species, some of them very large trees. Almost all belong to tropical and sub-tropical countries, of the vegetation of which they often form a most important feature. They abound in India, in every jungle and hilly situation, to the most northern Himalaya, and some of them are cultivated about every village. Both *F. religiosa* (the Peepul) and *F. Rumphii* are held in veneration by the Hindus. The most notable species are the Common Fig (see below); the Banyan (q. v.); the Peepul (q. v.), Bo Tree or Sacred Fig of India; the Sycamore (q. v.); and the East Indian Caoutchouc (q. v.) Tree. The leaves of some species are entire, those of others are lobed. Several species of fig exhibit the character for which the banyan in particular has become celebrated, of sending roots straight down to the ground from their spreading branches, and thus multiplying the apparent stems, by which a vast canopy of branches and foliage is supported. The East Indian Caoutchouc or India Rubber Tree is remarkable for the exposure of its roots, which appear in masses above ground, extending on all sides from the base like great writhing snakes. Some figs are creeping or trailing shrubs, with slender stems, covering heaps of stones, or ascending trees like ivy.—Besides the Common Fig, many species yield edible fruits, although none of them are nearly equal to it in value. Amongst them are the Peepul (*F. religiosa*), *F. Benjamina*, *F. pumila*, *F. auriculata*, *F. Rumphii*, *F. Bengalensis*, *F. aspera*, *F. racemosa*, and *F. granatum*, all East Indian, also the Sycamore of Egypt.—The milky juice of some species is bland and abundant, as of *F. Saussureana*, which has therefore been ranked among Cow-trees. In other species, the milky juice is very acrid. That of the Common Fig produces a burning sensation on the tongue. That of *F. toxicaria*, a native of the Malayan islands, is used for poisoning arrows.—Lac (q. v.) is gathered from some species.—The leaves of *F. politoria* are so rough that they are used for polishing wood and ivory in India. The juice of the fruit of *F. tinctoria* is used in Tahiti to dye cloth: the colour is at first green, but being acted on by the juice of a *Cordia*, it becomes bright red. The bark supplies cordage, of which fishing-nets are made.

The Common Fig (*Ficus Carica*) is a native of the East, as the specific name *Carica* (from *Caria*) imports; but it is now cultivated throughout the whole of the south of Europe, and is even found naturalised there. Its cultivation has also extended to many warm countries. In North America, it is seldom to be seen further north than Philadelphia; and it is not sufficiently hardy to be a common fruit tree in Britain, although even in Scotland figs may occasionally be seen ripened on a wall; and in the south of England fig-trees are sometimes grown as standards, and a few small fig orchards exist. Protection is always given in some way during winter. Near Paris, and in some other parts of the continent of Europe, fig-trees are so trained that the branches can be tied in bundles and laid along the ground, when they are covered with litter and earth. The fig is a low deciduous tree or shrub, with large deeply lobed leaves, which are rough above, and downy beneath. The branches are clothed with short hairs, and the bark is greenish. The fruit is produced singly in the axils of the leaves, is pear-shaped, and has a very short stalk; the colour in some varieties is bluish-black; in others, red, purple, yellow, green, or white. The varieties in cultivation are numerous. In warm climates, the fig yields two crops in the year—one from the older wood (midsummer shoots of the preceding year), and a second from the young wood (spring shoots of the same year); but in colder regions the latter never comes to perfection. Fig-trees are propagated by seed, by suckers, &c.; very frequently by layers or by cuttings. In Britain, they are often to be seen in hothouses, and grow well in pots. Dried figs form an important article of food in the Levant; in more northern regions, they are used for dessert, or for medicinal purposes, being applied to gumboils and other sores, and also administered in pulmonary and nephritic affections, and to relieve habitual constipation. The pulp contains about 62 per cent. of a kind of sugar called *Sugar of Figs.* Figs are either dried in the sun or in ovens built for the purpose. Great quantities are annually imported into Britain from the Mediterranean. The best are mostly brought from Smyrna, and are known as *Turkey figs*, of which those called *Eleme* or *Elemi* are most highly esteemed. Figs of inferior quality are imported in considerable quantities in the form of *fig-cake*, pressed along with almonds into cakes somewhat like small cheeses. In the Levant, Portugal, and the Canaries, a spirit is distilled from fermented figs.



Common Fig (*Ficus Carica*):
a, male flower, magnified; *b*, male flower, natural size; *c*, female flower, magnified; *d*, female flower, natural size.

FI'GARO, a dramatic character introduced on the Parisian stage in 1785 by Beaumarchais (q. v.) in his *Barbier de Seville* and his *Mariage de Figaro.* These plays, in which F., who coolly outwits every one, is first a barber and then a valet-de-chambre, secured for their author a brilliant reputation not only in France, but also in Germany, where many translations and adaptations of the pieces appeared. Mozart, Paesiello, and Rossini also made them the basis of classic operas. Since their publication, the character of F. has stood as a type of cunning, intrigue, and dexterity. After the restoration of the Bourbons, a literary periodical, distinguished for its satirical talent, assumed the name.

FIGEAC, a town of France, in the department of Lot, is situated in a valley surrounded by finely wooded hills on the right bank of the Sellé, 32 miles east-north-east of Cahors. It is irregular, its streets are narrow, and badly planned, and its houses in general not well built, but the antiquity and quaintness of many of its buildings give it a picturesque and interesting appearance. It has two beautiful Gothic churches, one of them, that of St Sauveur, has a choir of the 11th, a general superstructure of the 15th, and a modern front of the 19th century. F. owes its origin to a Benedictine monastery, founded by Pepin in 755 A.D. It has some cotton manufactures, and a trade in wine and cattle. Pop. 6820.

FIGHTING FISH (*Macropodus pugnax* or *Ctenops pugnax*), a small fresh-water fish, of the family *Anabasidæ* (q. v.), a native of the south-east of Asia, and particularly of Siam, where it is very commonly kept as goldfishes are in Britain, but on account of its pugnacity. Two of these creatures when brought together, often rush immediately to combat, or it is even enough to introduce a looking-glass into the water, and the fish hastens to attack its own image. Fish-fights are a favourite amusement of the Siamese; the licence to exhibit them yields a considerable annual revenue; and an extraordinary amount of gambling takes place in connection with them; not merely money and property, but children and liberty being sometimes staked. The F. F. has the anal and dorsal fins prolonged into tapering points. When the fish is quiet, its colours are dull; but when it is excited, they glow with metallic splendour, and 'the projected gill-membrane, waving like a black frill around the throat, adds something of grotesqueness to the general appearance.'

FIGUE'RAS, a town in the north-east of Spain, is situated near the French frontier, in the province of Gerona, in a fruitful district, 20 miles north-north-east of the town of Gerona. Its streets are gloomy, but it has beautiful promenades. On a height near the town is the citadel of S. Fernando, the strongest fortress of Spain, and the key of the Pyrenees on their south side, with accommodation for 20,000 men. This fortress has been so frequently taken by the French, as to give rise to the remark, common enough among the Spaniards, that the citadel of S. Fernando, in time of peace, belongs to Spain, but in time of war to France. Pop. 8350.

FI'GULINE. See POTTER'S CLAY.

FIGURANTES is the term applied in the ballet to those dancers that do not come forward alone, but dance in troops, and also serve to fill up the scene and form a background for the solo dancers.

FI'GURATE NUMBERS. The nature of

figurate numbers will be understood from the following table:

	1,	2,	3,	4,	5,	6,	7,	&c.
I.	1,	3,	6,	10,	15,	21,	28,	&c.
II.	1,	4,	10,	20,	35,	56,	84,	&c.
III.	1,	5,	15,	35,	70,	126,	210,	&c.
			&c.			&c.		

The natural numbers are here taken as the basis, and the first order of figurate numbers is formed from the series by successive additions; thus, the 5th number of the first order is the sum of the first five natural numbers. The second order is then formed from the first in the same way; and so on.

If instead of the series of natural numbers, whose difference is 1, we take series whose differences are 2, 3, 4, &c., we may form as many different sets of figurate numbers. Thus:

	1,	3,	5,	7,	9,	&c.
I.	1,	4,	9,	16,	25,	&c.
II.	1,	5,	14,	30,	55,	&c.
III.	1,	6,	20,	50,	105,	&c.
		&c.			&c.	

Or—

	1,	4,	7,	10,	13,	&c.
I.	1,	5,	12,	22,	35,	&c.
II.	1,	6,	18,	40,	75,	&c.
III.	1,	7,	25,	65,	140,	&c.
		&c.			&c.	

The name *figurate* is derived from the circumstance, that the simpler of them may be represented by arrangements of equally distant points, forming geometrical figures. The numbers belonging to the first orders receive the general name of *polygonal*, and the special names of *triangular*, *square*, *pentagonal*, &c., according as the difference of the basis is 1, 2, 3, &c. Those of the second orders are called *pyramidal* numbers, and according to the difference of the basis, are triagonally, quadragonally, or pentagonally pyramidal. The polygonal numbers may be represented by points on a surface; the pyramidal by piles of balls.

The general formula for polygonal numbers, from which any particular one may be found by substituting the proper values for n and r is,

$$\frac{(r-2)\,n^2-(r-4)n}{2}$$

where n = number of the term required, r = the denomination (3 if triagonal, 5 if pentagonal, &c.).

FIGURE, in general, is the outline or surface of a body determining its form or shape. In Arithmetic, figure denotes a numerical character such as 1, 2, 3, &c. Figure, in Geometry, denotes a surface or space enclosed on all sides, and is superficial when enclosed by lines; solid, when by surfaces. See REGULAR FIGURES, SIMILAR FIGURES, &c.

FIGURED BASS, in Music, is a bass part with figures placed over the notes, which indicate the harmony to be played to each note, and serves as a guide to the accompanist. Ludovico Viadana is said to have been the inventor of figured bass in the 17th century.

FIGURE-STONE. See SOAP-STONE.

FI'GWORT (*Scrophularia*), a genus of plants of the natural order *Scrophulariaceæ*, having a nearly globose corolla, with a small 5-lobed limb; the lowest lobe reflexed; and four stamens with an additional rudimentary one. They are mostly herbaceous plants, and natives of the temperate parts of the eastern hemisphere, not possessed of much beauty either in flowers or foliage. The roots of some are purgative and emetic. The leaves of the KNOTTED F. (*S. nodosa*), a common plant in moist grounds in Britain, are used for fomentation of tumours, repellent powers being ascribed to them, and in the form of an ointment in cutaneous diseases. A decoction of them is used to cure scab in swine. They have a fetid odour when bruised, and their taste is acrid. The tuberous root was formerly esteemed in scrofula, but perhaps only on account of a supposed resemblance to scrofulous tumours.

FIJI, FEEJEE, or VITI ISLANDS, a group of islands of volcanic origin, in the South Pacific Ocean, situated in lat. 15° 30′—20° 30′ S., and long. 177°—178° W. They were discovered by Tasman, the Dutch navigator, in 1643. There are altogether about 225 islands, 80 of which are said to be inhabited. The principal are—Viti Levu, or Great Fiji, and Vanua Levu (Great Land), the former having an area of about 90 miles by 50, with an estimated population of 50,000, and the latter extending over 100 miles in length, with a breadth of 20 miles, and a population of about 30,000. The total population of the group has been variously stated at from 130,000 to 300,000. Of the other islands, the most important and best known are Ovolau, the residence of most of the whites; Vuna, or Somosomo; Kandavu, Koro, Mbau, and Taviuni. Shoals and reefs surround the islands, making the access to them very dangerous. Earthquakes are common, and destructive hurricanes are periodical. The temperature ranges from 60° or 70° to upwards of 120°; but the mean is set down at about 80°. On Vanua Levu, there are several hot springs, ranging from 200° to 210°. The soil, which is of a deep yellow loam, and well watered, is exceedingly fertile, even to the very summits of the mountains, which, in Great Fiji, reach an elevation of more than 4000 feet. The chief vegetable productions are the bread-fruit tree, the banana, plantain, and cocoa-nut. The yam and the taro are extensively raised, and great care is bestowed on the culture of the yangona (kava), from which an intoxicating liquor is obtained. The sugar-cane, arrow-root, nutmeg, caraway, capsicum, tea-plant, &c., flourish. Cotton grows wild, two kinds of tomato are found, and the botany, so far as can be judged, is rich. The domestic animals seem to be limited to a few fowls and hogs. The agricultural implements of the Fijians are of the most primitive character; but in manufactures of a rude kind they are further advanced than other Polynesians. The natives are of middle size, strong limbed and short necked; complexion between a copper colour and a black, and hair dark, curly, and bushy. They are horrible cannibals, and shipwrecked mariners frequently fall victims to their insatiable appetite for human flesh, though they are said to prefer coloured to white men, objecting to the latter that 'they smell too much of tobacco.' The Fijians are divided into various tribes, each governed by its own chief, whose rule is absolute, and to whom, in a variety of ways, the most abject homage is tendered. Of late years, great efforts for their conversion have been made, especially by Wesleyan missionaries. In 1857, there were 54,281 attendants upon the religious services conducted by these missionaries. Compare Williams and Calvert's *Fiji and the Fijians* (2 vols., Lond. 1858). A letter in the *Athenæum* (February 22, 1862), and dated 'Levuka, Fiji, August 2, 1861,' affords still more recent information concerning these islands. From this source, we learn that in order to escape from the insupportable exactions and tyrannies of the Tonguese (the boldest and most ambitious of all the Polynesians), who have planted hostile colonies in Great Fiji, the king and chiefs of this island formally offered to cede it to Great Britain. Her Majesty's consul, Mr Pritchard, at once hastened to England with the news, and on his return intimated to the Fijians that Her

Majesty's government had taken the cession into favourable consideration. The king and chiefs thereupon solemnly ratified their offer, and to all intents and purposes the island may be now regarded as a British possession. Its progress (1861) is becoming quite visible already. 'Men of capital,' says the writer in the *Athenæum*, 'are beginning to flock hither; flourishing plantations of sugar, coffee, and cotton are established, and extensive tracts of land have been purchased for sheep runs.'

FILANGIE'RI, Gaetano, one of the most distinguished judicial writers and reformers of his century, was born of noble parentage at Naples in 1752. Having early abandoned the career of arms to which he was originally destined, he devoted his intellect to the study of morals, politics, and legislation. In 1774, the promulgation of some wise judicial reforms, limiting the arbitrary jurisdiction of courts, having met with considerable opposition from these legal officials, young F. published a defence of the royal decree, and at once attracted the favourable notice of court and minister. In 1777, he was appointed court-chamberlain; and in 1780, published the first volume of his great work, *La Scienza della Legislazione.* The first part is devoted to an analysis of the essentially fixed ethics of legislation, and of those principles which are modifiable according to local and national exigences; the second treats of the two great problems of all political economy, wealth and population; the third, of criminal law in its widest extent; the fourth, of public instruction; and the fifth, which considers ecclesiastical and religious law, was on the eve of being published, when its author, in 1788, was prematurely cut off at the age of 36, leaving in this work an incomplete but splendid monument to the noble sense of justice and the exalted humanity of its author. The best Italian edition, which also includes his *Opuscoli Scelti*, is in *I Classici Italiana* (6 vols. 8vo, Milan, 1822).

FILA'RIA. See Guinea-worm and Thread-worm.

FILBERT. See Hazel.

FILE, FILING. A file is a steel tool, having its surface covered with teeth or serratures, and used for cutting down and shaping metals and other hard substances. There is little doubt that in the earliest stages of metal-working, when bronze implements first superseded those of stone, rough stones were used for the purposes to which files are now applied; nevertheless, the use of files dates from high antiquity. They are mentioned in the Old Testament in the first book of Samuel, xiii. 21, also in the *Odyssey*.

Files are made of almost every conceivable shape, to suit the very varied purposes to which they are applied—flat, square, round or *rat-tail*, triangular, half-round, feather-edged, &c., besides being variously bent, in order to get at intricate work. Nearly all these files are made thicker in the middle, or 'bellied,' the object of which will be explained under Filing.

Files require to be made of the very best steel, which is first forged into the required shape, and is then called a 'blank.' The blanks are then finished more accurately to the required form by grinding, planing, or filing.

The blanks thus prepared and well softened (see Tempering) are next handed to the cutter, who sits astride on a low bench or stool, and has before him a stone anvil, with a flat piece of pewter laid upon it. The blank is held upon the anvil, with its tang towards the cutter, by means of a long loop of leather-strap, into which the cutter places his foot. He then cuts the teeth by striking with a hammer a short stout chisel, held obliquely at an angle of about 12° or 14° from the perpendicular. The object of this will be easily understood; for, if the chisel were perpendicular, a furrow like the letter V would be indented, and an equal burr struck up on each side; but, instead of this, a cutting tooth like that of a saw, but with less obliquity, is required; this is effected by the obliquity of the chisel, and a burr is thrown up on one side only—viz., towards the tang.

The astonishing regularity observable in the distance between the teeth is secured in this way: The cutting is commenced at the point of the file; the chisel is then drawn backwards, laid upon the blank, and slid forwards till it reaches the burr raised by the last cut; the blow is now struck, and another tooth and burr produced, which serves as a guide for the next cut; and so on. The distance between the teeth thus depends on the force of the blow and the obliquity of the cut; for the heavier the blow, the greater the ridge or burr, and the obliquity determines the distance of the cut from the burr; the skill of the workman consists, therefore, in the precise regulation of the blows.

Most files are double cut—that is, they have two series of *courses* of chisel-cuts, which are oppositely inclined at an angle of about 55° to the central line of the file. The second course is made in the same manner as the first, but with lighter blows, and is usually somewhat finer than the first. This angular crossing converts the ridges into pointed teeth. Files used for soft metals which are liable to clog the teeth, are single cut—that is, they have but one course of cuts. Taper files have the teeth finer towards the point. Rasps for wood are cut with pointed chisels; each tooth being an angular pit with a strong burr, instead of a long furrow. The newly cut teeth in the soft steel are preserved from injury by being laid upon the softer pewter block before referred to. The rapidity with which the blows are struck varies with the fineness of the file; 60 or 80 cuts are commonly made per minute.

Files have to be very carefully hardened and tempered. If heated too strongly, or made too hard, the steel is so brittle that the teeth tear off; if too soft, they wear down rapidly, and the file soon becomes useless. Great care is also required in keeping them straight, as the sudden cooling necessary for hardening is very apt to warp the steel.

At first sight, it would appear, from the simplicity and continual repetition of the movements required in file-cutting, and the precision and regularity of the work, that it is an operation specially adapted for machinery. Many attempts have been made to cut files by machinery, but with only partial success; the chief difficulty arises from the necessity of modifying the force of the blow to suit the hardness of the steel. It is practically impossible to supply a large number of blanks all of exactly the same hardness; and if the machine be adjusted to suit the hardness of one blank, it may strike too heavy or too light a blow for the next; whereas the workman *feels* at once the hardness of the steel he is working upon, and adjusts his blows accordingly.

Filing.—To the uninitiated, this may seem a simple operation of rubbing one piece of metal upon another, and requiring only muscular strength and no skill. This is far from being the case, for a skilful workman will, in a given time, with a given amount of muscular work, cut away a far greater quantity of metal with a file than one who is unskilful, for he makes every tooth *cut into* the work, instead of *rubbing over* it. To do this, he must adapt the pressure and velocity of motion of the file to the coarseness of its teeth, and the hardness, brittleness, and toughness of the material he is working upon.

To *file flat*, that is, to avoid rounding the sharp edges of a narrow piece of work, is very difficult, and some years of continual practice is required before an apprentice can do this well, especially in 'smoothing up' or finishing work before polishing, and there are some who never succeed in filing, smoothing, and polishing without rounding the edges of fine work. The power of doing this constitutes the main test of skill among mathematical instrument makers and other metal-workers. The flattest surface can be obtained by laying the work, where its form admits, upon a piece of cork held in the vice, and filing it with *one hand*, the pressure on the file being communicated by the forefinger.

It is mainly to aid the workman in filing flat that the rounded or bellied form is given to files; this partially compensates the tendency of the hands to move in a curved line with its convexity upwards when they move forward and apply pressure, as in the act of filing.

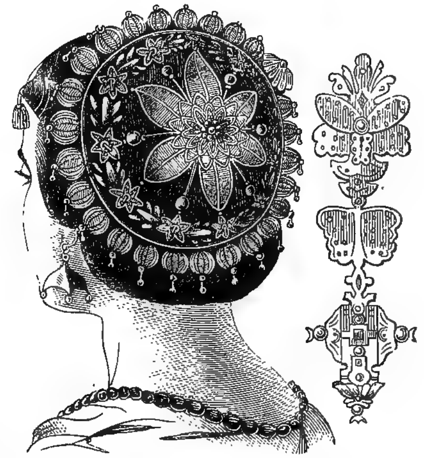
FILE (Fr. *file*, a row, Lat. *filum*, Ital. *fila*, *filo*), in a military sense, is used to signify any line of men standing directly behind each other, as *rank* refers to men standing beside one another. In ordinary formations of the present day, a battalion stands two deep, or in two ranks—front and rear—wherefore a file consists of two men. Sometimes, however, the battalion may be formed much more solidly, as in a square, when the file comprises a far larger number. The number of files in a company describes its width, as the number of ranks does its depth: thus, 100 men in 'fours deep' would be spoken of as 25 files in 4 ranks.

FILIA'TION, the correlative of paternity. In the law of Scotland, the filiation of a child is the process by which its paternity is determined. The general rule that the father is he whom the marriage points out (*pater est quem nuptiæ demonstrant*), is a presumption which may be overcome by shewing its impossibility in point of fact—as, for example, where the husband is impotent, or where he has been absent from his wife during the period between the eleventh solar and the sixth lunar month preceding the birth. As regards natural children, a *copula* more than ten months before birth does not filiate, but it forms an important adminicle of proof, which, till the passing of 16 Vict. c. 20, it was held might be completed by the oath of the mother. As to the effect of that statute on the previously existing law, see EVIDENCE, and SEMI PLENA PROBATIO.

FILICA'JA, VINCENZO, a lyrical poet of Italy, was born at Florence, of an ancient but impoverished family, in 1642. Deeply wounded, while yet a youth, in his affections, he resolved to dedicate his undivided genius to heroic, martial, and sacred themes, forswearing all amatory compositions for the future, and perversely consigning his exquisite love inspirations to the flames. In six sublime odes, F. celebrated the deliverance of Vienna in 1683 from the besieging forces of the Turks, chiefly effected by the heroism of John Sobieski, king of Poland, and of Charles Duke of Lorraine. On the publication of the odes in Florence in 1684, F. became, almost in spite of himself, famous, and attracted the notice of Queen Christina of Sweden, an ardent admirer and munificent protectress of Italian letters and genius. Relieved from harassing pecuniary embarrassments by the liberal patronage of Christina, F. was enabled, with undisturbed powers, to devote himself to composition, some of his most touching verses being addressed to his royal benefactress. Patriotic sonnets, the grandest of which is a lament over the internal weakness of Italy—*Italia, Italia, O tu cui feo la sorte*—and heroic odes, severely classic in form, are the chief works of Filicaja. His career as patriot, citizen, and man, won him reverence and love as universal as was the admiration accorded to his works. In advanced age, he was appointed judge and senator, and in 1702 was called to one of the highest magisterial offices in Florence, where he died in honoured peace, September 24, 1707. His works, under the title of *Poesie Toscane di Vincenzo da Filicaja, Senatore Fiorentino e Accademico della Crusca*, were published after his death. The best edition is that of Venice (2 vols. 1762), containing both the Italian and Latin verses of the author.

FI'LICES. See FERNS.

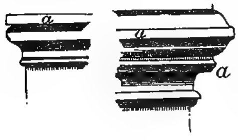
FI'LIGREE, from the Italian *filigrana* (*filo*, a thread or wire, and *grano*, a grain or bead), the old filigree-work being ornamented with small beads. The name is now applied to delicate wire-work ornaments, usually made of gold or silver wire, which is twisted into spirals and other convoluted forms; and these spirals, &c., are combined to form a sort of metallic lace-work, which is shaped into brooches, earrings, crosses, head ornaments, and others of a very light and elegant character. This work is chiefly done in Malta, Sardinia, the Ionian Islands, and some parts of Turkey. It sometimes receives the general name of *Maltese work*.



Filigree Ornaments:
From a drawing by M. Mariana, in the Florence Exhibition (1861).

FI'LIPO-D'ARGIRO, SAN, a town of Sicily, in the province of Catania, and about 30 miles west-north-west of the town of that name, stands on the right bank of the Traina, in an exceedingly fertile district. It contains a ruined Saracenic castle, and several religious edifices. Saffron of good quality, and in considerable quantity, is grown in the vicinity. Pop. 7300. San F. stands on the site of the ancient Sikelian city of Agyrium, the birthplace of Diodorus Siculus the historian, and which, about 400 B.C., is said to have had 20,000 citizens.

FI'LLAN, ST. Two Scoto-Irish saints of the name of Fillan appear in the church calendars, and have left their mark on the topography of Scotland and Ireland. (1.) ST FILLAN, or Faolan, surnamed the Leper, had his yearly festival on the 20th of June. His chief church in Scotland was at the east end of Loch Erne, in Perthshire, where 'St Fillan's Well' was long believed to have supernatural powers of healing. A seat in the rock of Dunfillan still keeps the name of 'St Fillan's Chair;' and two cavities beside it are said to have been hollowed by St F.'s knees in prayer. His Irish church is at Ballyheyland (anciently called Killhelan or Kill Faelain), in the barony of Cullenagh, in Queen's County. (2.) St Fillan, the abbot, the son of St Kentigerna of Inchcaileoch, in Loch Lomond, lived in the 8th c., and had his yearly festival on the 7th or 9th of January. His church in Ireland was at Cluain Maoscna, in Fartullach, in the county of Westmeath. His chief church in Scotland was in Perthshire, in the upper part of Glendochart, which takes from him the name of Strathfillan. Here, a well-endowed priory, dedicated in his honour, was repaired or rebuilt in the beginning of the 14th century. King Robert Bruce made a grant of money to the work, in gratitude, probably, for the miraculous encouragement which he was said to have received on the eve of Bannockburn from a relic of the saint—one of his armbones enclosed in a silver case. Another relic of St F.—the silver head of his crosier, or pastoral staff—has been preserved to our time. It is called the 'Coygerach' or 'Quigrich,' and appears in record as early as the year 1428, when it was in the hereditary keeping of a family named Jore or Dewar, who were believed to have been its keepers from the time of King Robert Bruce. They had half a boll of meal yearly from every parishioner of Glendochart who held a merk land, and smaller quantities from smaller tenants; and they were bound, in return, to follow the stolen cattle of the parishioners wherever their traces could be found within the realm of Scotland. The Quigrich, besides its virtues in the detection of theft, was venerated also for its miraculous powers of healing. In 1487, the right of keeping it was confirmed to Malice Doire or Dewar by King James III. in a charter, which was presented for registration among the public records of Scotland so lately as the year 1734. Sixty years later, the Quigrich still commanded reverence; but its healing virtues were now only tried on cattle, and its once opulent keepers had fallen to the rank of farm-labourers. It was publicly exhibited in Edinburgh in the year 1818, before being carried to Canada, where it now is, in the hands of a descendant of its old custodiers, a farmer named Alexander Dewar. He puts such a value on the relic, that he has hitherto refused to part with it for less than £400 sterling, or 1000 acres of Canadian land. It has been recently figured and described by Dr Daniel Wilson in a paper in the *Canadian Journal*, No. xxiv., reprinted in a pamphlet, with the title of *The Quigrich, or Crosier of St Fillan* (Toronto, 1859); and in the *Proceedings of the Society of Antiquaries of Scotland*, vol. iii. part ii. p. 233, plate xxvi. (Edin. 1861). A linn in the river Fillan or Dochart, in Strathfillan, was long believed to work wonderful cures on insane persons, who were immersed in the stream at sunset, and left bound hand and foot till sunrise in the ruins of the neighbouring church of St Fillan. A hand-bell, which bore the name of St Fillan, was also believed to work miracles.



Fillets.

FILLET, in Architecture, a small space or band like a narrow ribbon used along with mouldings. *a, a, a* (see fig.) are examples of fillets, both in classic and Gothic architecture.

FILLET, in Heraldry, is an ordinary which, according to Guillim, contains the fourth part of the chief.

FI'LLIBUSTERS, another name for the piratical adventurers whose origin and history are treated of under Bucaneers (q. v.). Recently, it has become familiar to English ears as the designation of certain lawless adventurers belonging to the United States, who have attempted violently to possess themselves of various countries in North America. The plea urged by these persons has generally been, that such countries were a prey to anarchy and oppression, and could only attain to prosperity by annexation to the United States, and the introduction of 'democratic' institutions—amongst which, strange to say, slavery stands prominent. The most notorious of these fillibusters was the late William Walker, whose expedition against Nicaragua in 1855 was so far successful that he kept his ground in that country for nearly two years. At last, he was driven out by a combination of the various states of Central America. He was subsequently captured and shot, September 12, 1860, at Truxillo, in Central America, in the course of another piratical expedition.

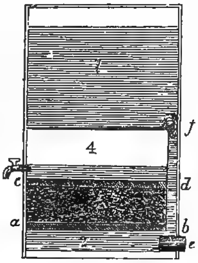
FILLMORE, Millard, an American statesman, the thirteenth president of the United States, was born in Cayuga county, New York, on the 7th of January 1800. His history presents a remarkable example—not, however, unparalleled in America—of one who, without the advantages of early education, and without any aid from influential connections, has risen to the very highest position in the government. His parents removed, near the close of the last c., from New England to Cayuga county, which was then a wilderness. Young F. reached, it is said, the age of 19 without ever having seen a grammar or a geography. In 1821, he removed to Erie county, in the western part of New York, making the journey principally on foot. Soon after, he entered a law-office in Buffalo, and, while pursuing his legal studies, supported himself by teaching a school. He commenced the practice of law at Aurora, in Erie county, and in a few years rose to eminence in his profession. He was elected in 1829 to the state legislature, and in 1832 was chosen a representative to Congress. Here he distinguished himself by the faithfulness and ability with which he discharged his public duties. He was elected in 1832 by the anti-Jackson party, and was re-elected as a Whig in 1836, 1838, and 1840. In 1841, Mr F. was appointed chairman of the committee of Ways and Means, after the speakership, the most responsible as well as the most honourable position in the House of Representatives. Under his auspices and direction, the celebrated tariff of 1842 was prepared and carried through the House. In 1848, he was elected to the vice-presidency of the United States, with General Taylor as president, and entered upon the duties of his office in March 1849. General Taylor having died in July 1850, Mr F. succeeded to the presidency for the unexpired portion of the term of four years. Although his party was a minority in both houses of Congress, his administration was marked by a number of useful measures, and rarely has a president of the United States acquired and deserved so high a character for vigour, firmness, and impartiality. Among his most important measures may be mentioned the expedition sent out under Commodore Perry for the purpose of opening the ports of Japan to American commerce—an undertaking which was, at least for the time, eminently successful. When he retired from office on the 4th of March 1853, he left the country in the enjoyment of a high degree of prosperity. He was the candidate of the American party for the presidency in 1856; but in the contest which followed, Mr Buchanan, the democratic nominee, was chosen president. Since his retirement from public life, Mr F. has resided at Buffalo—which has been his home for some thirty years—where he enjoys among all classes that high consideration to which, by his talents and integrity, he is so justly entitled.

FILTER, FILTRATION. When solid matter is suspended in a liquid in which it is insoluble, it may be separated by various means. Under the article FINING, various methods of causing such suspended matter to collect together and sink to the bottom or float on the surface, and thereby clearing the liquid, are described. The process of filtration consists in passing the liquid through some porous substance, the interstices of which are too small to admit of the passage of the solid particles, the principle of the action being the same as that of a sieve; but as the particles of fluids are immeasurably small, the pores must be extremely minute.

One of the simplest forms of filter is that commonly used in chemical laboratories for separating precipitates, &c. A square or circular piece of blotting-paper is folded in four, the corner where the four folds meet is placed downwards in a funnel, and one side is partly opened, so that the paper forms a lining to the funnel. The liquid passes through the pores of the paper, and the solid matter rests upon it. The chief advantages of this filter are its simplicity, and the ease with which the solid matter may be removed and examined.

A simple water-filter for domestic purposes is sometimes made by stuffing a piece of sponge in the bottom of a funnel or the hole of a flower-pot, and then placing above this a layer of pebbles, then a layer of coarse sand, and above this a layer of pounded charcoal three or four inches in depth. Another layer of pebbles should be placed above the charcoal, to prevent it from being stirred up when the water is poured in. It is obvious that such a filter will require occasional cleaning, as the suspended impurities are left behind on the charcoal, &c. This is best done by renewing the charcoal, &c., and taking out the sponge and washing it. By a small addition to this, a cottage-filter may be made, which, for practical use, is quite equal to the most expensive filters of corresponding size. It consists of two flower-pots, one above the other; the lower one is fitted with the sponge and filtering layers above described, and the upper one with a sponge only. The upper pot should be the largest, and if the lower one is strong, the upper one may stand in it, or a piece of wood with a hole to receive the upper pot may rest upon the rim of the lower one. The two pots thus arranged are placed upon a three-legged stool with a hole in it, through which the projecting part of the lower sponge passes, and the water drops into a jug placed below. The upper pot serves as a reservoir, and its sponge stops the coarser impurities, and thus the filtering layers of the lower one may be used for two or three years without being renewed, if the upper sponge be occasionally cleaned. Care must be taken to wedge the upper sponge tightly enough, to prevent the water passing from the upper pot more rapidly than it can filter through the lower one.

A great variety of filters are made on a similar principle to the above, but constructed of ornamental earthenware or porcelain vessels of suitable shape. It would occupy too much space to enter upon the merits of the filters of different makers, especially as there is really very little difference between them in point of efficiency, and nearly all the domestic filters that are offered for sale are well adapted for their required purpose. In purchasing a filter, the buyer must not be satisfied with merely seeing that the water which has passed through it is rendered perfectly transparent—this is so easily done by a new and clean filter—but he should see that the filter is so constructed as to admit of being readily cleansed, for the residual matter must lodge somewhere, and must be somehow removed. When large quantities of water have to be filtered, this becomes a serious difficulty, and many ingenious modes of overcoming it have been devised. In most of these, water is made to *ascend* through the filtering medium, in order that the impurities collected on it may fall back into the impure water. Leloge's ascending filter consists of four compartments, one above the other; the upper part, containing the impure water, is equal in capacity to the other three. This communicates by a tube with the lower one, which is of small height. The top of this is formed by a piece of porous filtering-stone, through which alone the water can pass into the third compartment, which is filled with charcoal, and covered with another plate of porous stone. The fourth compartment, immediately above the third, receives the filtered water, which has been forced through the lower stone, the charcoal, and the upper stone. A tap is affixed to this, to draw off the filtered water, and a plug to the second or lower compartment, to remove the sediment.



Leloge's Filter:
1, 2, 3, 4, the four compartments; *ab*, the first porous stone of third or filtering compartment; *cd*, the exit filtering stone of *d*; *e*, the plug to remove for cleaning out second compartment; *f*, a loose sponge at entrance of communicating tube.

In the diagram shewing this filter in section, the figures 1, 2, 3, and 4 indicate the corresponding compartments. At *f*, the top of the tube by which the first and second compartments communicate, a sponge may be placed to stop some of the grosser impurities.

Since 1831, when this filter was contrived, a number of ascending filters have been patented, many of them being merely trifling modifications of this. Bird's Syphon Filter is a cylindrical pewter vessel containing the filtering media, and to it is attached a long coil of flexible pewter pipe. When used, the cylinder is immersed in the water-butt or cistern, and the pipe uncoiled and bent over the edge of the cistern, and brought down considerably below the level of the water. It is then started by applying the mouth to the lower end, and sucking it till the water begins to flow, after which it continues to do so, and keeps up a large supply of clear water. This, of course, is an ascending filter, and the upward pressure is proportionate to the difference between the height of the water in the cistern and that of the lower end of the exit tube. See SYPHON. Sterling's filtering tanks are slate cisterns divided into compartments, the water entering the first, then passing through a coarse filter to a second, and from there through a finer filter to the main receptacle, where the filtered water is stored and drawn off for use.

A common water-butt or cistern may be made to filter the water it receives by the following means: Divide the cistern or butt into two compartments, an upper and a lower, by means of a water-tight partition or false bottom; then take a wooden box or small barrel, and perforate it closely with holes; fit a tube into it, reaching to about the middle of the inside, and projecting outside a little distance; fill the box or barrel with powdered charcoal, tightly rammed, and cover it with a bag of felt; then fit the projecting part of the tube into the middle of the false bottom. It is evident that water can only pass from the upper to the lower compartment by going through the felt, the charcoal, and the tube, and thus, if the upper part receives the supply, and the water for use is drawn from the lower part, the whole will be filtered. It is easily cleaned by removing the felt and washing it.

Various means of compressing carbon into solid porous masses have been patented, and filters are made in which the water passes through blocks of this compressed carbon. Most of these are well adapted for the purpose, but their asserted superiority over filters composed of layers of sand and charcoal is doubtful. A very elegant and convenient portable filter for soldiers, travellers, and others who may require to drink from turbid ponds and rivers, was constructed of Ransome's filtering stone, and is also made of the compressed carbon. A small cylinder of the stone or carbon is connected with a flexible India-rubber tube in such a manner that the cylinder may be immersed in a river, the mouth applied to a mouth-piece at the other end of the tube, and the water drawn through the filtering cylinder.

The filtration of water on a large scale will be treated of under WATER-SUPPLY.

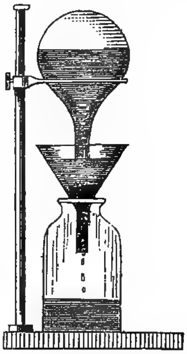
Some very interesting experiments were made by Mr H. M. Witt, to ascertain whether soluble matter, such as common salt, is in any degree removed from water by filtration. Theoretically, it has been assumed that this is impossible, since the filter only acts mechanically in stopping suspended particles; but the results of Mr Witt's experiments shew that from five to fifteen per cent. of the soluble salts were separated by sand-filters such as above described. This is a curious and interesting subject, well worthy of further investigation. Another most important matter, on which a series of accurate experiments is required, is to ascertain to what extent soluble organic matter may be decomposed by filtration, especially by charcoal filters, and to ascertain how long charcoal and other porous matter retains its property of acting on organic matter in watery solution. The power of dry charcoal in decomposing organic matter in a gaseous state is well established (see below), and it is also well known that fresh charcoal acts powerfully upon organic matter in solutions, but the extent to which this power is retained in the charcoal of a filter in continuous action has not been satisfactorily ascertained. This is of the highest importance, as it sometimes happens that water of brilliant transparency, and most pleasant to drink, on account of the carbonic acid it contains, is charged with such an amount of poisonous organic matter as to render its use as a daily beverage very dangerous. Charcoal obtained from burning bones is still more efficacious than charcoal from wood. A filter of animal charcoal will render London porter colourless. Loam and clay have similar properties. Professor Way found that putrid urine and sewer-water, when passed through clay, dropped from the filter colourless and inoffensive.

When a liquid contains mucilaginous or other matter having viscous properties, there is considerable difficulty in filtering it, as the pores of the medium become filled up and made water-tight. Special filters are therefore required for syrups, oils, &c. Such liquids as ale, beer, &c., would be exceedingly difficult to filter, and therefore they are clarified by the processes described under FINING. Oil is usually passed through long bags made of twilled cotton cloth (Canton flannel). These are commonly 4 to 8 feet long, and 12 to 15 inches in diameter, and are enclosed in coarse canvas bags, 8 or 10 inches in diameter, and thus the inner filtering-bag is corrugated or creased, and a large surface in proportion to its size is thus presented. Syrups are filtered on a small scale by confectioners, &c., by passing them through conical flannel bags, and on a large scale in the *creased bag-filter* just described. Thick syrups have to be diluted or clarified with white of egg, to collect the sediment into masses, and then they may be filtered through a coarse cloth strainer. Vegetable juices generally require to be treated in this manner.

The simple laboratory filter has to be modified when strong acid or alkaline solutions, or substances which are decomposed by organic matter, require filtration. Pure silicious sand, a plug of asbestos, pounded glass, or clean charcoal, are used for this purpose. Böttger recommends gun-cotton as a filter for such purposes. He has used it for concentrated nitric acid, fuming sulphuric acid, chromic acid, permanganate of potash, and concentrated solutions of potash and aqua regia. He says that properly prepared gun-cotton is only attacked at ordinary temperatures by acetic ether.

Filtering paper for laboratory purposes requires to be freed from inorganic impurities that are soluble in acids, &c.; this is effected by washing the paper with hydrochloric acid, or, when thick, with nitric and hydrochloric acid, and removing the acid by washing thoroughly with distilled water.

When a considerable quantity of liquid has to pass through a filter, it is sometimes desirable that it should be made to feed itself. In the laboratory, this is done by inverting a flask filled with the liquid over the filtering funnel, the mouth of the flask just touching the surface of the liquid when at the desired height in the funnel. As soon as it sinks below this, air enters the flask, and some liquid falls into the funnel. On a large scale, self-acting filters are fed by the common contrivance of a ball-cock and supply-pipe.



Air Filters.—The extraordinary powers of charcoal in disinfecting the gaseous products evolved from decomposing animal and vegetable matter, have been made available by Dr Stenhouse in constructing an apparatus for purifying air that is made to pass through it. A suitable cage, containing charcoal in small fragments, is fitted to the opening from which the deleterious gases issue, and is found to render them perfectly inodorous, and probably innocuous. The first application of this was made in 1854, when a charcoal air-filter was fitted up in the justice-room of the Mansion House, London, the window of which opens above a large urinal, the smell of which was very offensive in the room. The filter at once destroyed the nuisance, and 'although six years have elapsed, the charcoal has never required to be renewed.' 103 of such filters have been applied to the outlets of the sewers of one district of the city of London, and no bad smell is observable where they are placed, and no obstruction offered to the ventilation of the sewers. They have been applied with like results in two or three county towns. The subject is fully treated by Dr

Stenhouse in a letter to the lord mayor, published by Churchill (London). Charcoal respirators are small air-filters of the same kind applied to the mouth. See RESPIRATOR.

FI'MBRIATED (Lat. *fimbria*, a border or hem), is said, in Heraldry, of an ordinary having a narrow border or edging of another tincture.

FINAL JUDGMENT. The meaning of this term in the law of Scotland having led to some dispute, an Act of Sederunt (q. v.) was passed on the 11th July 1828, declaring it to be applicable to a case in which 'the whole merits of the cause have been disposed of, although no decision has been given as to expenses, or, if expenses have been found due, although they have not been modified or decerned for.' The importance of the definition arises from the fact, that only final judgments can be carried by advocation from the inferior to the superior courts. 'The whole merits of the cause' has been held to mean, not only the merits of the action to which the advocator is a party, but also those of any other conjoined with it. If the parties in the conjoined action will not proceed to have it determined, the advocator ought to apply to the inferior judge, stating his intention to advocate, and praying him to call on the parties to proceed with the conjoined process; and, failing their doing so, to disjoin the causes, which disjunction will render an advocation competent. Shand's *Practice*, i. p. 454. In Advocations (q. v.) and Suspensions (q. v.), if the record be closed, and the proof concluded in the inferior court, the case may be taken at once to the Inner House without a judgment of the Lord Ordinary, 13 and 14 Vict. c. 36. In order to warrant an appeal to the circuit court in a civil cause (where otherwise competent) not only the merits must have been disposed of, but the expenses modified and decerned for.

FINA'LE, the name given to that part of a musical composition which finishes the act of an opera; also to the last movement of an instrumental composition, as in the symphony, quartet, quintet, sonata, &c. The character of the finale, in purely instrumental works, is always lively. In the opera, it depends on the subject, while in some operas the finale consists of an aria alone, as in Mozart's *Figaro*, instead of the usual full concerted music for soli and chorus.

FINA'NCE, a French word incorporated with our language, means the art of managing money matters, the person who professes this art being called a financier. Finance, in the plural, is often used for money itself, but still with a reference to the purpose to which it is to be applied, as where the finances of a country are said to have improved or fallen off—that is to say, have become abundant or scanty according to the expenditure of the country. Sometimes the word is applied to private wealth, but it is properly applicable to public funds. We use it in this country rather in a political and economic sense than officially, but in France there have been, from time to time, comptrollers-general of finance, councils of finance, bureaus of finance, &c. Many statesmen have been spoken of as great financiers, from the talent which they have shewn for adjusting national revenue and expenditure, as Colbert, Turgot, and Necker in France, and Godolphin and Peel in Britain. As a branch of statesmanship, finance is intimately connected with other branches. In questions of national policy—such as, whether a state can go to war or not—the financier is the person who is expected to count the cost, and say how the necessary funds are to be obtained. In the question, whether an unpopular or oppressive tax is to be abolished, the financier is an authority on the question, whether the government can do without it. Hence, there is a special connection between finance and taxation, which has become closer and stronger since the progress of political economy has shewn that the taxes which are the most productive, and even the most easily collected, are not always the best, looking at the gain or loss of a nation, in the long-run. Turgot said that finance was the art of plucking the fowl without making it cry. On this notion, the principle of indirect taxation achieved its popularity. For instance, customs duties seem to fall on no one. The importer and the retailer add them to the price of the article, and the ultimate purchaser only knows that the article is dear without experiencing the sense of hardship felt by one who pays out money directly in the shape of a tax. But many indirect taxes have, on the other hand, been found to affect the trade and the wealth of communities to an extent which has made them very deleterious in comparison with direct taxes. See further on matters connected with finance the heads CUSTOMS; DEBT, NATIONAL; CORN LAWS; EXCISE; FREE TRADE; TAXATION; REVENUE.

FINCH (Ger. *Fink;* for the origin of the word, see CHAFFINCH), the popular name of a great number of species of little birds of the order *Insessores*, and tribe *Conirostres.* Many of them have great powers of song, and are called *Hard-billed Song-birds*, in contradistinction to the Warblers (*Sylviadæ*) or *Soft-billed Song-birds.* The name F. is sometimes used as equivalent to *Fringillidæ* (q. v.), either in its more extensive or more restricted application; but the limits of its popular use are very indeterminate, and some birds are equally known as finches and as linnets, or as grosbeaks, &c. The word F. often forms part of the popular name of birds of this family, as bullfinch, chaffinch, hawfinch, pine-finch, &c.

FINDER OF GOODS. The finder acquires a special property in goods, which is available to him against all the world except the true owner; but before appropriating them to his own use, he must use every means within his power to discover the owner. It has been decided that if the property had not been designedly abandoned, and the finder knew who the owner was, or, with due exertion, could have discovered him, he was guilty of larceny in keeping and appropriating the articles to his own use. Armourie *v.* Delamirie, 1 Str. 505; Merry *v.* Green, 7 M. and W. 623. In the latter case, in which a person purchased, at a public auction, a bureau, in which he afterwards discovered, in a secret drawer, a purse containing money, which he appropriated to his own use, Mr Baron Parke thus laid down the law. 'The old rule, that "if one lose his goods, and another find them, though he convert them *animo furandi* to his own use, it is no larceny," has undergone in more recent times some limitations. One is, that if the finder knows who the owner of the lost chattel is, or if, from any mark upon it, or the circumstances under which it is found, the owner could be reasonably ascertained, then the fraudulent conversion, *animo furandi*, constitutes a larceny. Under this head fall the cases where the finder of a pocket-book with bank-notes in it, with a name on them, converts them *animo furandi;* or a hackney-coachman, who abstracts the contents of a parcel which has been left in his coach by a passenger whom he could easily ascertain; or a tailor, who finds and applies to his own use a pocket-book in a coat sent to him to repair by a customer whom he must know: all these have been held to be cases of larceny; and the present is an instance of the same kind, and not distinguishable from them' (Pp. 631, 632).

FI'NDHORN, a river rising on the west side of the Monadh Liadh Mountains, in the east of Inverness-shire. It runs north-east through the counties of Inverness, Nairn, and Elgin, in the valley of Strathdearn, passes Forres, and enters the Moray Firth at the village of Findhorn by a lagoon three by one and a half miles in extent, after a course of about 90 miles. Its waters abound in salmon and trout. Its basin consists of gneiss in the upper part, and of old red sandstone in the lower. At one place, it rose nearly 50 feet in the great floods of August 1829, known as the 'Moray Floods,' and did much damage. West of the mouth of the F. are the Culbin Sands, in one part 118 feet high, and covering 9500 acres of a formerly fertile tract.

FINE OF LANDS, in England, fictitious proceedings formerly in common use in order to transfer or secure real property by a mode more efficacious than an ordinary conveyance. A fine is defined by Coke, quoting from Glanville, an amicable composition and final agreement by leave and licence of the king or his justiciaries; and such indeed it was in its original effect, and it was called a fine because it put a termination (*finis*) to all litigation between the parties, and those claiming through them, in regard to all matters touching the suit. The proceedings in a fine were shortly as follow: The party to whom the land was to be conveyed commenced a fictitious suit against the vendor. But the case was no sooner in court than the plaintiff asked leave to agree or settle with the defendant. This leave having been obtained, a covenant was entered into whereby the vendor or defendant, called the *cognizor*, recognised the right of the plaintiff, called the *cognizee*, to the lands, of which he admitted that the plaintiff was wrongfully kept from the possession. These proceedings, which at first were real, were afterwards adopted universally without having a shadow of foundation in fact. This solemn farce having been completed, a *note* of the fine, being an abstract of the covenant, the names of the parties, and the parcels of the land, was entered on the rolls of the court; and the business was concluded by what was called the *foot* of the fine, setting forth the parties, the time and place of agreement, and before whom the fine was levied. The whole was embodied in indentures commencing *hæc est finalis concordia*. It was necessary that a fine should be levied openly in the Court of Common Pleas, or before the chief-justice of that court, or before two or more commissioners appointed in the country. Fines were of four kinds, which need not be specified here. In order that a fine should have full effect, it required to be levied with *proclamations*, i. e., open proclamation of the transaction in court. A fine so levied cut off the right even of strangers who failed to assert their claim during the period allowed by law; hence an estate was said to be barred by fine and non-claim. A fine levied by a married woman had the effect of cutting off all right she might have in the lands, and was the only mode by which a married woman could convey lands; and in order to protect her from undue influence, she was privately examined as to the voluntary nature of the transaction. A fine levied by tenant in tail cut off the estate tail, but did not affect remainders; hence, though a fine was sometimes used to bar an entail, the usual method was by common Recovery (q. v.). But while a recovery was the most effectual method of barring an entail, it required the consent of the tenant in possession. Where, then, that consent could not be obtained, or where the tenant in tail was at the same time tenant in fee in remainder, a fine was a convenient mode of barring the entail. The statute *De Donis* prohibited fines as a means of barring entails, but this restriction was removed by 32 Hen. VIII. c. 36.

The old law as to fines has been abolished by the *Fines and Recoveries Act*, 3 and 4 Will. IV. c. 74. This act was passed for the purpose of abolishing the cumbrous machinery used in the transfer of land according to the ancient forms and fictions. The act abolishes all the fictions formerly in use. In regard to fines and recoveries by heirs of entail, it permits every tenant in tail of freehold land whether in possession, in remainder, or contingency, to dispose of the lands for an estate of fee-simple absolute, or any less estate, by any of the ordinary conveyances, except a will, at common law, or under the statute of Uses (q. v.). The conveyance must be registered in the Court of Chancery within six months after its execution. But where there is an estate of freehold prior to the estate tail, the act requires that the consent of the tenant of the freehold shall be necessary in order to give full effect to the conveyance. This person is called the *protector of the settlement*. Where a conveyance is made without consent of the protector, it has the effect of barring those only who would succeed under the heir by whom it is executed. This is precisely the effect which under the old law belonged to a recovery without the consent of the tenant to the *præcipe*, and of a fine levied by a tenant in tail; so that the statute, while it abolishes the fictions, sustains entails as family settlements to the limited effect which they formerly possessed. In regard to fines by married women, the act provides that a Feme Coverte (q. v.) may dispose by deed of any lands, or of money subject to be invested in the purchase of lands. It is necessary, unless specially dispensed with by the court, that her husband should concur in the conveyance, and that she should acknowledge it before a judge of one of the superior courts at Westminster, or a Master in Chancery, or two of the commissioners appointed for that purpose under the act.

FI'NGAL'S CAVE. See STAFFA.

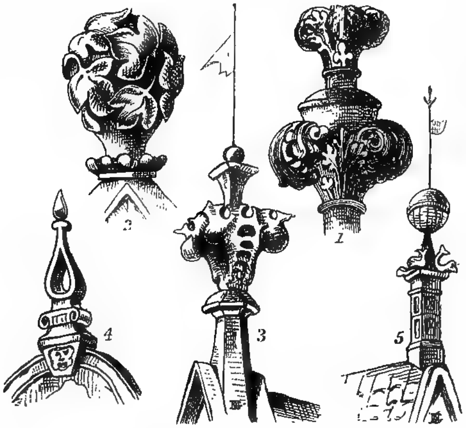
FINGER-BOARD, that part of a stringed musical instrument, as in the violin, violoncello, guitar, &c., which is made of ebony-wood, and glued on the neck of the instrument, and shaped on the top somewhat round, to suit the position in which the strings lie on the nut and the bridge. At the lower end, the finger-board projects over the sounding-board of all those instruments played with the bow, while in the guitar species the finger-board is glued down on both neck and sounding-board. The strings are stretched along the finger-board from the nut at the top to the bridge at the lower end, and are pressed down by the fingers of the left hand, to make the different notes in music; while the right hand produces the sound either by a bow or the points of the fingers.

FINGERS. See HAND.

FINGERS-AND-TOES, the popular name of a disease in turnips, called also ANBURY (q. v.).

FI'NIAL, an ornament, generally carved to resemble foliage, which forms the termination of pinnacles, gables, spires, and other portions of Gothic architecture. There are traces of foliated terminations, both in stone and metal, on the pediments of classic buildings (see ACROTERION), but it was not till the 12th c. that the finial proper was introduced. During the latter part of that century and the whole of the 13th c., finials of the most perfect form and of infinite variety were used as the crowning ornaments of every salient point in the buildings of the period (see fig. 1). The architects of the 14th c., in finials, as in other ornaments, imitated more closely the forms of natural foliage; but their finials had neither the variety of design nor the vigour of outline of those of the preceding century (see fig. 2).

In the 15th and 16th centuries, the finials became more and more meagre in form, and are frequently only four crockets set upon a bare pyramidal terminal. Some variety of effect is often obtained during this period by surmounting the finial with a gilded vane. This is common in Tudor and domestic architecture (fig. 3). Finials were carved both in stone and wood, and in the latter material with great delicacy and minuteness. In connection with metal-work, finials of metal were used, and whatever the material adopted, its natural capabilities were made a source of special beauty.



Finials:
1, from Bishop Bridport's Monument, Salisbury Cathedral; 2, York Minster; 3, Maulbroun, Germany; 4, Crew Hall, Cheshire; 5, Augsburg.

The finial is one of the most effective ornaments of Gothic architecture, and when that style was succeeded by the revival of classic, in the reign of Queen Elizabeth, our forefathers could not persuade themselves to part with the finials to their buildings. We thus find in Elizabethan architecture a great variety of finials; they are, however, almost entirely of a geometric form, and without foliage (fig. 4), and are frequently, especially when terminating wooden gables, combinations of finial and vane partly wood and partly iron (fig. 5). In the stricter classic which succeeded the Elizabethan, some traces of the favourite finial still remain in the balls, obelisks, &c., used as terminations, and also in the shields and supporters (themselves a remnant of feudalism) which form the crowning ornament of gate-piers, pedestals, &c.

FINING, the process of clearing turbid liquors, such as beer, wine, &c. The simplest mode of fining is by passing the liquor through a porous substance that retains the solids and allows the clear liquid to pass through (see FILTER); but this method is only applicable to particles mechanically suspended in a limpid liquid. When the liquid contains mucilaginous or other matter, that readily clogs the filter, some other means of fining must be used. Such is the case with all malt liquors and most wines when turbid. When in good condition, these do not usually require fining, as the suspended matter agglomerates, and sinks to the bottom shortly after the fermentation is completed. When this does not take place, some means of promoting such action are usually adopted. One of the simplest is to add soluble albumen, such as white of egg, to a portion of the liquid, and after beating it well in this, to add the mixture, and stir it into the whole of the liquid. Upon the application of heat, the albumen coagulates and contracts from its diffusion into a scum, enveloping and drawing together the suspended matter. The scum is then easily removed. This method is adopted for syrups and other liquids that may be heated without mischief. In making clear soups, the albumen of the meat performs this function. As alcohol coagulates albumen, it may be used for fining wines and cordials without the application of heat. It is generally used for red wines. Malt liquors are usually fined by means of gelatine, either isinglass or cheaper substitutes being used. One pound of isinglass is soaked in three or four pints of water, or sour beer, then more sour liquor added as the isinglass swells, until it amounts to about a gallon. The jelly thus formed is next dissolved in seven or eight gallons of the liquor to be fined. This solution, having the consistence of a syrup, is called 'brewers' finings,' and about a pint to a pint and a half is added to a barrel of ale or porter, or to a hogshead of cider or wine. The action of this depends upon the combination of the gelatine with the astringent matter (tannic acid) of the liquor, forming thereby an insoluble solid, which sinks to the bottom, and carries with it, like the coagulating albumen, the suspended matter; but as the flavour of malt liquors partly depends upon the astringents they contain, the fining affects the flavour; the astringents also help to preserve the liquor, and hence their removal is in this respect disadvantageous. Malt liquors thus fined do not 'stand well on draught.' The use of gelatine for fining red wines is objectionable, as in most of these the astringent flavour is an esteemed quality, and therefore albumen is preferred.

Other methods of fining are adopted. Sugar of lead is sometimes added, and afterwards one-half its weight of sulphate of potash dissolved in water. By this means, an insoluble sulphate of lead is precipitated, which in subsiding carries down other matters with it. This is a dangerous process, the salts of lead being poisonous. If properly conducted, the whole of the lead may be precipitated, but a casual mistake in the quantities might cause the death of many people. Ox-blood is used in the same manner as albumen and isinglass. Lime, alum, alcohol, and acids act by coagulating albumen &c., contained in the liquor. Plaster of Paris, clay, and even sand, are sometimes used to carry down the suspended matters. A strip of isinglass or a piece of dried sole-skin is often used for fining coffee, and it acts in the manner above described. Liquors that are unusually difficult to fine are called 'stubborn' by coopers and cellarmen.

FINISTÈRE, or **FINISTERRE** (Lat. *Finis terræ*, 'Land's End'), a department at the western extremity of France, comprehending a part of the former duchy of Bretagne, has an area of 2648 square miles, and a population of 606,552. It is traversed from east to west by two low but picturesque chains of hills. Its coast is very rugged and broken, its shores bristling with dangerous granite rocks, and fringed with many islands. The soil, one-third of which is occupied by sandy tracts and marshes, is moderately productive; and, owing to the vicinity of the sea, which washes the northern, western, and southern shores of the department, the climate is mild and humid. Corn, hemp, and flax are grown in considerable quantities. In the valleys, smiling meadows everywhere occur. The silver and lead mines of F. are very valuable; those of Pouillaouen and Huelgoet being about the richest in France. Its principal rivers are the Aulne, the Elorn, and the Odet. The first of these is connected by a canal with the Blavet, and forms part of the great line of communication by water from Brest to Nantes. This department is divided into the following five arrondissements: Quimper, Brest, Châteaulin, Morlaix, and Quimperlé. Quimper is the chief town.

FINISTERRE, Cape, or **LAND'S END**, is the name given to a promontory at the north-western extremity of Spain, in lat. 42° 54′ N., and long. about 9° 20′ W. It is the *Promontorium Nerium* of the ancients.

FI'NLAND (Fin. *Suomesimaa*, land of lakes and marshes) is a grand duchy of Russia, lying between 59° and 70° N. lat., and between 21° and 33° E. long., is about 750 miles from north to south, and has an average breadth of about 185 miles. According to the Russian census of 1851, the population was 1,636,915, which, in accordance with the previous rate of increase, would give a population of about 1,800,000 for 1862. The area of F. may be estimated at about 135,000 square miles, of which nearly one-third is occupied by marshes and lakes. The largest of these sheets of water, independently of Lake Ladoga, which belongs partly to the Russian province of Olonetz, are Lakes Puruvesi, Payane, Enara, and Saima; the last of these, which is about 180 miles in length, constitutes a portion of the system of water-communication which has been established between the central parts of the country and the Gulf of Finland. The lakes are especially numerous in the south-west of F., where they are almost all united together by rivers and waterfalls, round the central lake of Pyhäjärvī. The surface is a table-land, from 400 to 600 feet above the level of the sea, with occasional higher elevations. There are, however, no mountain-ranges, and hence the rivers are unimportant; but in the north the country is intersected by a sandy ridge known as the 'Maanselkae,' which merges, under the name of the Lapintunturit Mountains, into the great Lappo-Norwegian Alpine chain. The coast-line is generally low, but to the south it is skirted by numerous rocky islands, separated from the land by narrow channels, difficult of navigation, but well adapted for purposes of defence against hostile attacks from the sea. The principal geological formations are friable granite, hard limestone, and slate. The forests of F. are still very abundant, although they have been recklessly cut down in many parts of the country for the sake of their ashes, which are used to stimulate the soil, whose natural poverty requires to be counteracted by frequent manuring. Pine and fir predominate, but birch, beech, oak, &c., thrive in the south parts of the country, where some good pasture-land is to be met with. Since the incorporation of F. with Russia, agriculture has declined, and fishing and cattle-breeding increased in importance. The most valuable exports of F. are, however, the products of its forests, as timber, pitch, potash, tar, and rosin, for although it still yields some grain, the supply is scarcely greater than the home demand, although, when it belonged to the Swedish crown, F. was regarded as the granary of Sweden for barley and rye. Wheat and oats are but little grown. Few fruits ripen except hardy berries; and in the extreme north, vegetation is almost limited to mosses and liverworts. F. yields some copper, iron, lime, and slate, but it produces scarcely any salt, which constitutes one of the principal articles of import. Reindeer, wolves, elks, beavers, and various kinds of game abound; while the numerous lakes, and the adjacent gulfs, supply the inhabitants with an abundance of salmon, herring, and other fish. The climate is rigorous, and winter, which lasts seven or eight months, is succeeded by a brief spring, which passes almost suddenly into a short but hot summer of six or seven weeks, succeeded in its turn by a rainy season, which ushers in the return of cold weather. In the north, the sun is absent during a part of December and January, and almost perpetually above the horizon during the short summer. F. is divided into eight læenes or governments—Nyland, Abo-Biorneborg, Tawastehuus, Wiborg, Kuopio, St Michel, Wasa, Uleaborg, which are included in the three dioceses of Abo, Borgo, and Kuopio, and contain in all 214 parishes. The predominant form of religion is the Lutheran, but the Greek Church has of late years been gaining ground. The courts of law are held at Abo (the ancient capital), Wasa, and Wiborg; and there is one university, which was founded in 1640 at Abo, but removed from thence to the present capital, Helsingfors, in 1829. The highest administrative authority is vested in the imperial senate for F., consisting of 16 members, nominated by the emperor, and presided over by the governor-general of Finland. The army, which numbers 6000 men, has the privilege of serving in distinct corps, without being incorporated in the general forces of the empire. The naval force also forms a distinct squadron, under its own national flag.

The early history of F. is shrouded in obscurity, and little is known of the people before the 12th c., when Eric the Saint, king of Sweden, exasperated by their piratical inroads, undertook a crusade against them, and compelled them, by force of arms, to profess Christianity. The hold which the Swedes then acquired over the country was never wholly lost till 1809, when Sweden secured peace with Russia by the cession of all F. and the island of Aland; before that time, however, the Russians had at various epochs wrested portions of the Finnish territories from the Swedes, while F. had been for centuries the perpetual cause and scene of wars between the two nations. The Swedish language had taken such deep root in F., that the efforts of the Russian government to displace it in favour of the native Finnish have hitherto met with only partial success, and in many parts of the country, the people still openly prefer their old masters. The inhabitants, who call themselves *Suomes*, and are denominated *Tschudes* by the Russians, have, however, no affinity of race with the Swedes, and may be regarded as differing from all other European nations, excepting the Lapps and the Finmarkers, to whom they are very probably allied. See Finns and Finnish Literature.—For further information, see Gerschau, *Versuch einer Gesch. Finland* (1821); Rühs, *Finland* (Stockh. 1827); Friis, *Beskrivelse over de norske Finlapper* (1841); Gylden, *Histor. och statis. Anteckning. om Städerna i Finland* (1845); Stockfleth, *Bidrag til Kunds. om Finnerne i Norge;* Topelius, *Finland fræmställdt i Teckning* (1860).

FINLAND, Gulf of, the eastern arm of the Baltic Sea, between 22° and 30° E. long., and between 59° and 61° N. lat. Its coasts are entirely Russian territory. It receives the waters of the great lakes Onega and Ladoga. The water of the gulf is not deep, and only very slightly salt. The topography of the Gulf of F., which has been thoroughly elucidated by Struve, forms an interesting part of the great work of the Russian survey of the Baltic.

FINLAY, George, a distinguished historian, was born in Scotland about the commencement of the present century. Circumstances induced him to take up his residence in Athens, where he has patiently and industriously devoted himself to the study of the later Greek history. The fruits of his labour and researches are contained in his *History of Greece under the Romans*, 146 B.C. *to* 717 A.D. (London, 1843; 2d ed. 1857); *History of Greece from its Conquest by the Crusaders to its Conquest by the Turks, and of the Empire of Trebizond*, 1204—1461 A.D. (London, 1851); *History of the Byzantine and Greek Empires*, 716—1453 A.D. (London, 2 vols., 1853—1854); *History of Greece under the Othoman and Venetian Dominion* (1854); and *History of the Greek Revolution* (Edin. Blackwood and Sons, 1861). F. is not regarded as a philosophical historian, in the highest sense of the term; but he has been earnest and indefatigable in his endeavours to obtain a solid and accurate conception of the times about which he has written, and has thus been enabled to throw a flood of new light on the obscurity of modern Greek history. F. also exhibits a profound knowledge of Greek art, antiquities, and topography.

FI'NMARK, a province of Norway, and the most northern part of the continent of Europe, lying between 68° 30′ and 71° N. lat., and 17° and 31° E. long., constitutes Norwegian Lapland (q. v.). Area about 24,000 square miles, of which three-fourths are occupied by the continent, the rest belonging to the numerous islands which skirt its north-west shores, and terminate in the North Cape. Innumerable fiords and bays indent the coast. The interior is intersected by a snow-covered range of mountains, reaching an elevation of 4000 feet; the line of perpetual snow being here less than 3000 feet above the level of the sea. Agriculture is impracticable above an elevation of 100 feet; a few berries are the only fruits that ripen; and although barley, potatoes, and a few other vegetables thrive in some parts, fish and game constitute almost the sole food of the inhabitants. In the north, where no trees are to be found, the turf of the marshes affords a good supply of fuel. The thin vegetable mould which covers the stony soil yields grass for the sheep and cows, which graze on the declivities of the rocks skirting the fiords and creeks. The principal source of wealth is the reindeer in the north, and the cod-fisheries in the south. The pop., which does not exceed 50,000, consists principally of Lapps (see LAPLAND), a people of Finnish origin. Hammerfest, the capital of F. (70° 40′ N. lat.), is the most northern town of Europe.

FINNISH LITERATURE. To Elias Lönnrot of Helsingfors belongs the merit of having rescued from utter oblivion some of the numerous sagas and songs which had for ages been recited by the Finnish *Runolainen*, or singers, to the sound of the *kantela*, or harp, and thus transmitted from one generation to another. Although his researches were limited to the district of Karelia, in the government of Kupio, he obtained numerous songs and proverbs, and a complete epos, consisting of 32 parts, each of which contained from 200 to 700 verses. This singular monument of the earlier culture of the people was published by him in 1835, under the title of *Kalewala* (the ancient name of Finland), but it met with little notice till the academy of Dorpat made it the subject of discussion at their meetings in 1840. This publicity soon attracted the attention of foreign philologists, and led to its translation into Russian, Swedish, and German. The learned Finnish scholar, Carsten, the Grimms, and Brockhaus, agree in regarding the *Kalewala* as a pure epic, and characterise it as a composition possessing a thoroughly Oriental appreciation of nature, an almost unparalleled wealth of images and tropes, great flexibility of rhythm, and a copiousness of synonyms not to be met with in any other northern tongue. There is less unanimity in regard to the character of the plot, for while one critic believes that the incidents refer to definite historical epochs, another regards them as purely allegorical. But whatever discrepancy of opinion there may be in this respect, the *Kalewala* is admitted by all who are entitled to form a judgment of its merits, to be one of the most curious monuments of the kind possessed by any European people. The date of its composition must be referred to a period anterior to the introduction of Christianity amongst the Finns in the 14th c., while there is even strong internal evidence, from an identity of the names and traditions of the *Kalewala* with many still current in Esthonia, that the poems very probably belong to an epoch anterior to the immigrations of the Karelians into the districts which they now occupy. The publication of the *Kalewala* has given a powerful impetus to the study of the Finnish language, which the Russian government effectively sustains by encouraging the cultivation and use of their native tongue by the Finlanders. The upper classes still cling to the use of Swedish, but the peasantry and small landed proprietors welcome with avidity every addition to the limited stock of their printed literature. Finnish weekly papers circulate freely among them, and political questions are discussed with an enthusiasm which is never met with among similar classes in Scandinavia or Russia Proper, but which affords additional proof of the diversity of character which distinguishes the Finn from either of the neighbouring nations with which he has been successively incorporated.

The prose literature of Finland is almost exclusively devoted to religious and moral subjects. The Bible was translated into Finnish in 1642, but a part of the Old Testament had been translated a century earlier. Several Finnish poets have acquired a reputation of late years, but their works breathe the same melancholy tone which so strongly characterises the more ancient poems of Finland. Lönnrot has made a collection of about 7000 proverbs (*Suomen kansan Sanalskuja*, 1842), and about 2000 charades (*Suom. kans. arwoituskia*, 1851). See Erman's *Archiv f. d. Kunde v. Russland. Tengström i Fosterländskt Alb.* (Helsingf.)

FINNS, geographically, the name of the inhabitants of Finland; but in ethnology, that of a considerable branch of the Ugrian race, dwelling for the most part in Finland, though with some representatives in Sweden and Norway as well. The Ugrians have been classed among the nations said to have a Mongolian origin. Dr Latham places them among the 'Turanian Altaic Mongolidæ,' and divides them into Ugrians of the East, and Ugrians of the West. The Western Ugrians consist of Lapps, Finns, Permians, and other nations or tribes in the north and north-west of Russia, and of the Magyars in Hungary. The Magyars are the most numerous, and next after these come the Finns, comprising about 2,000,000 of individuals. All the other tribes of Western Ugrians do not together comprise so many. The F., in common with the other Ugrians, are of the Mongolian type. A recent traveller, Mr Bayard Taylor, describes them as having 'high cheek-bones, square, strong jaws, full, yet firm lips, low broad foreheads, dark eyes and hair, and a deeper, warmer red on the cheeks than on those of the rosy Swedes. The average height is, perhaps, not quite equal to that of the latter race, but in physical vigour there is no inferiority, and there are among them many men of splendid stature, strength, and proportion.' Other travellers bear similar testimony to the physical appearance of the F. proper, or those of pure Finnish blood; but although these form the majority, there are many, in the towns especially, who pass for F., while, in reality, they are quite as much entitled to be called Swedes, or even Russians, on account of the frequent intermarriages of the F. with individuals of those two nations. The F., from having been originally a nomadic race, have for many centuries been stationary and civilised. Long before the arrival of the German and Slavic nations in the north of Europe, the Ugrians, or *Ogres* (for the name so common in fiction is really of historic origin), possessed it, and were gradually pushed further north and east by the new invaders. Both F. and Lapps, there is good reason to believe, originally extended much further south than they do at present, occupying, perhaps, the whole of Sweden and Norway. 'The Finns,' says Prichard, 'were, in the time of Tacitus, as savage as the Lapps; but the former, during the succeeding ages, became so far civilised as to exchange a nomadic life for one of agricultural pursuits; while the Lapps have ever continued to be barbarous nomades, as well as the Siberian tribes of the same race—namely, the Woguls and Ostiaks. The Finns, as well as their brethren the Beormahs, or Finns of the White Sea, had probably undergone this change long before the time when they were visited by Otther, the guest of Alfred. When the Finns were conquered by the Swedes, they had long been a settled people, but one of curious, and singular, and isolated character.'

The Finnish *language*, like that of the other Ugrian nations, belongs to the Turanian family of languages, and hence offers some striking points of resemblance to the languages and dialects of the Turks, Tartars, Mongols, Mandshurians, Tungusians, and even Magyars or Hungarians. In Finnish, the nouns are not inflected, but an additional word is required to denote the variations of case, number, and sex. The prepositions and pronouns are suffixed to the words they modify. The verbs have only two tenses, past and present; the future being expressed by adding to the present some word indicating a future action or state of being. Rask considers the Finnish to be the most harmonious of tongues. Many Swedish, and a few Russian words have, of course, become incorporated with the language, in consequence of the social and political relations of the F. with those two countries. The F. of our time are doubtless the same race as the *Fenni* of Tacitus, and the *Phinnoi* of Strabo and Ptolemy, though not occupying the same geographical area. 'The nearest approach to a name at once general and native,' says Dr Latham, 'is Suomelaiset, meaning swamp, morass, or fen people; the term Finn and Finlander being of foreign origin.' With respect to the social habits, morals, and manners of the F., all travellers are unanimous in praising them. They are of a cheerful disposition, affectionate towards each other, and honest and honourable in their dealings with strangers. They are also cleanly in their persons, being much addicted to the use of the vapour-bath, to which circumstance may be attributed the strongly marked difference in physical appearance between them and the stunted Lapps, to whom, in language as well as many other respects, they stand closely related.

FINS (allied to Lat. *pinna* or *penna*, see letter F), organs adapted for swimming or locomotion in water. The limits of the application of the term are rather vague. It is always applied to the locomotive organs of fishes, when they possess special organs of locomotion, as almost all of them do; and equally to those organs (the pectoral and ventral fins) which are homologous to the limbs of other vertebrate animals, and to those (the vertical fins) which may be said to be superadded to them, and to belong to fishes alone; equally also to those which are furnished with rays, having a membrane stretched on them, as is generally the case in all the fins of fishes, and to those which consist, as in some fishes, of a mere fold of the skin, and which, when they exist in fishes, are in reality not very much organs of locomotion. The name fins is given to the locomotive organs of *Cetacea*, but not to those of any other *Mammalia*, even when, as in the case of the hind feet of seals, they approach very nearly to the character of the fins of fishes. Nor is it ever given to the webbed feet of birds. But it is often given to the swimming organs of invertebrate animals, as to the expansions of the mantle which serve this purpose in the *Cephalopoda*, and which are entirely destitute of rays.

FI'NSBURY, or FEN TOWN, a parliamentary borough of Middlesex, forming the north part of London (q. v.).

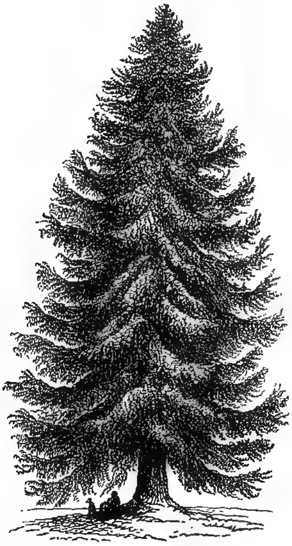
FI'NSCALE. See Rudd.

FI'NSTERAA'RHORN, the highest peak of the Bernese Alps. See Alps.

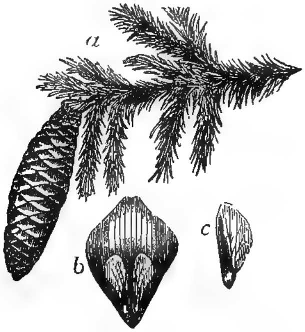
FINSTERWALDE, a small town of Prussia, in the province of Brandenburg, is situated on an affluent of the Black Elster, 40 miles north of Dresden. It has manufactures of cloth and machinery; spinning and weaving are carried on. Pop. 6335.

FI'ORIN. See Bent Grass.

FIR, a name often used in a sense co-extensive with the widest sense of the word Pine (q. v.), and therefore so as to include a large portion of the Coniferæ (q. v.), or at least the whole of the Linnæan genus *Pinus*. But the name fir is often also used in a more restricted signification, and the trees so designated are those forming the genus *Abies* of some authors, *Abies* and *Picea* of others, which the greater number of botanists have now agreed in separating from *Pinus*. The Scotch Fir, however, is a true Pine (*Pinus sylvestris*), and will be described along with its congeners. See Pine.—The genus *Abies* is distinguished from *Pinus* by the flat rounded apex of the scales of its cones, and by leaves not in clusters of definite number. Some botanists include the species of Larch (q. v.) and Cedar (q. v.) in the genus *Abies;* but if these be separated, no species with clustered leaves remain in this genus, which then contains only the different kinds of Spruce Fir and of Silver Fir, or species most nearly allied to those which ordinarily bear these names. All of them are evergreen. The Spruce Firs form the genus *Abies* of some authors, distinguished by short solitary leaves, scattered all round the branchlets, and by the scales of the (pendulous) cones being attenuated at the apex, and remaining fixed to the axis of the cone. The Silver Firs form the genus *Picea* of some, distinguished by the deciduous scales of the (erect) cones. It being supposed, however, that the Linnæan names had been given through mistake, and that the common Silver Fir is the true *Abies* of the ancients, and the Norway Spruce their *Picea*, Link has attempted, but without being followed by many, to restore these names to their ancient use, and to denominate the genera accordingly.—The Norway Spruce (*Abies excelsa* or *Pinus Abies*) is a noble tree, sometimes attaining the height of 180 feet, with long cylindrical pendulous cones, denticulate scales, and scattered, green, crowded, suddenly pointed, almost quadrangular leaves. It is the *Fichte* of the Germans, called also *Rothtanne* or *Schwarztanne*. Like the other kinds both of Spruce and Silver Fir, it exhibits the peculiar character of the *Coniferæ* more perfectly than many of the true Pines do, in its perfectly erect stem, from which proceed almost whorled horizontal branches.



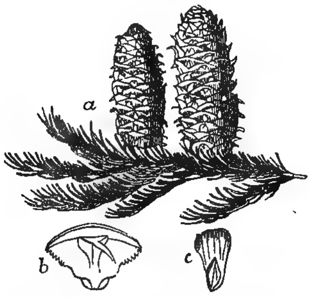
Common, or Norway Spruce Fir (*Abies excelsa*): Copied from Selby's *British Forest Trees*.



Cone of Norway Spruce Fir: *a*, branchlet and cone; *b*, scale, with seeds; *c*, a seed.

It is a very beautiful pyramidal tree, and when old, its long branches droop towards the ground. It forms entire forests in the middle and north of Europe and in Asia, chiefly upon elevated ridges, although it prefers moist places. It loves districts of primitive rock. In some places, it is found even within the Arctic Circle. It is not a native of Britain, but has long been very generally planted, although too often it is merely made a nurse for other trees, and is not allowed to attain a considerable age or size. It is of rapid growth, but is believed to live to the age of 400 years. It yields the same products as the Scotch Fir, resin, turpentine, tar, and lampblack (see these heads); but more resin than turpentine. The true Spruce Rosin flows spontaneously from the bark. The purest pieces are whitish or pale yellow, are sold under the name of Common Frankincense, and used for ointments and plasters, and when melted yield the common Burgundy Pitch (q. v.). The bark of the spruce is a good and cheap non-conductor of heat: the cones are an excellent substitute for tanners' bark. In Sweden and Norway, the inner bark is made into baskets; and the long and slender roots, split and boiled with alkali and sea-salt, are dried, and twisted into cordage, which is used both for vessels and by farmers. The wood is used for fuel and for house-building; it also supplies masts and spars for ships. It is the White Christiania Deal and Danzig Deal of the market, and is very largely imported into Britain from Norway and the Baltic. It is whiter, lighter, less resinous, and more elastic than the timber of Scotch Fir. The sapwood, whilst still in a gelatinous state, is sweet, and is eaten fresh in Sweden and Lapland; and the inner bark, in times of scarcity, is mixed with a little flour or meal of some kind, and baked into bread. The young shoots, still covered with their bud-scales, are in many parts of Europe used for fumigation. The leaf-buds are also employed medicinally in cases of scurvy, rheumatism, and gout. The pollen is often sold by apothecaries instead of the dust of the Club-moss or *Lycopodium*.—A very superior variety of this fir is known as the Red Norway Spruce. Dwarf varieties are cultivated amongst ornamental shrubs. —The Black Spruce (*Abies nigra*), of which the Red Spruce (sometimes called *A. rubra*) is regarded as a mere variety caused by difference of soil, and the White Spruce (*A. alba*), form great woods in North America. The Black Spruce is found as far north as lat. 65°. Both species are now common in plantations in Britain. Both have quadrangular leaves; those of the Black Spruce are of a dark glaucous green, those of the White Spruce are of a lighter colour. The cones of the Black Spruce are short, ovate-oblong, obtuse, and pendulous, with rounded scales ragged at the edge; those of the White Spruce are oval, and tapering to a point with entire scales. The Black Spruce is a valuable timber tree, supplying yards of ships, &c., but its planks are apt to split. The White Spruce is smaller, and the timber inferior. From the Black Spruce the *Essence of Spruce* is obtained, which is so useful as an antiscorbutic in long voyages, and is used for making spruce-beer. Spruce-beer is also made by adding molasses or maple sugar to a decoction of the young branchlets, and allowing the whole to ferment. From the fibres of the root of the White Spruce, macerated in water, the Canadians prepare the thread with which they sew their birch-bark canoes; and the seams are made water-tight with its resin. —From the twigs of the Oriental Fir (*A. Orientalis*), a native of the Levant, a very fine clear resin exudes, which is known by the name of Sapindus' Tears. This fir has very short quadrangular leaves, densely crowded, and uniformly imbricated.—The Hemlock Spruce of North America (*A. Canadensis*) forms great part of the forests of Canada and of the Northern States of America, extending northwards as far as Hudson's Bay. Its timber is not much esteemed, as it splits very obliquely, and decays rapidly in the atmosphere; but the bark is valued for tanning. The leaves are two-rowed, flat, and obtuse. The cones are scarcely longer than the leaves. The young trees have a very graceful appearance, but the older ones are generally much disfigured by remaining stumps of their lower branches.—*A. dumosa* of Nepal is very much allied to the Hemlock Spruce.—*A. Douglasii* is a noble tree, attaining a height of 250 feet, which forms immense forests in the north-west of America, from lat. 43° to lat. 52°. The bark, when the tree is old, is rugged, and 6—9 inches thick. It abounds in a clear, yellow resin. The timber is heavy, firm, and valuable; the growth very rapid.—*A. Menziesii*, a native of North California, very similar to *A. Douglasii* in general appearance, also produces timber of excellent quality.—*A. Brunoniana*, a Himalayan species, forms a stately blunt pyramid of 120—150 feet in height, with branches spreading like the cedar, and drooping gracefully on all sides. It is found only at considerable elevations. The wood is not durable, but the bark is very useful.—The Khutrow or Himalayan Spruce (*A. Smithiana*, called also *A. Morinda* and *A. Khutrow*) much resembles the Norway Spruce, but has longer and more pendulous branches. The wood is white, and not highly esteemed, although it readily splits into planks.—The Mount Enos Fir (*A. Cephalonica*), a native of Cephalonia, attaining a height of 60 feet, and a diameter of three feet, yields durable and very valuable timber.—All these species have been introduced into Britain, and some of them seem likely soon to be pretty common in our plantations, as well as others from the north-west of America and from the mountains of Asia, as *A. Wittmanniana*, &c., noble trees, and apparently quite suitable to the climate.—The common Silver Fir (*Picea pectinata*, or *Abies* or *Pinus picea*) has erect cylindrical cones, 5—6 inches long, and two-rowed leaves, with two white lines upon the under side. It forms considerable woods upon the mountains of Central Europe and of the north of Asia, and attains a height of 150—180 feet, and an age of 300 years. It is not a native of Britain, but large trees are now to be seen in very many places. The wood is white, contains little resin, is very soft and light, and is employed for the ordinary purposes of coopers, turners, and joiners, and in ship and house carpentry, also for making band-boxes and for many fine purposes, especially for the sounding-boards of musical instruments. The same resinous and oily products are obtained from the Silver Fir as from the Spruce and Scotch Fir, but of superior quality. It yields the beautiful clear turpentine known as Strasburg Turpentine. Very similar to the Silver Fir, but generally of much smaller size, and indeed seldom much above thirty feet in height, is the Balm of Gilead Fir (*Picea* or *Abies balsamea*), a native of North America from Virginia to Canada. The wood is of little value, but the tree yields Canada Balsam (q. v.). Besides these, a number of other species of *Picea* are found in the western parts of North America and in the Himalaya, some of which are trees of great magnitude, and yielding excellent timber, as *P. grandis*, a Californian tree of 170—200 feet in height—*P. amabilis*, a species much resembling it—*P. nobilis*, a majestic tree, which forms vast forests on the mountains of Northern California—*P. bracteata*, a Californian species remarkable for its slender stem, which rises to a height of 120 feet, and yet is only about one foot in diameter at the base, and likewise for the manner in which the middle lobe of each bractea of its cones is produced so as to resemble a leaf—*P. Webbiana*, the Himalayan Silver Fir, which, in its native regions, fills the upper parts of mountain valleys, and crowns summits and ridges at an elevation of upwards of 10,000 feet, a tree of great size, 35 feet in girth, and with a trunk rising 40 feet before it sends out a branch. Most of these have been introduced into Britain with good prospect of their succeeding well in our climate, and other species, as *P. Pichta*, a native of the Altai Mountains, very nearly resembling the Silver Fir, *P. Nordmanniana*, *P. Fraserii*, &c.—*P. religiosa* is a tall and elegant tree, a native of the mountains of Mexico, with slender branches, which are very much used by the Mexicans for adorning churches, and cones shorter than those of any other Silver Fir. *P. Jezoensis* is a new species recently introduced from Japan.

Silver Fir (*Picea pectinata*):
Copied from Selby's *British Forest Trees*.



Cone of Silver Fir:
a, branchlet and cones; *b*, a scale; *c*, a seed.

FIRDUSI, FIRDOWSI (Tusi), Abu'l-Kasim Mansur, the greatest epic poet of Persia, was born between 304—328 H., or 916—940 A. D., at Shadab or Rizvan, near Tus in Khorassan. Whether the name Firdusi (from *firdus*, garden, paradise) was given to him because his father (Fachreddin Ahmad) was a gardener, or on account of the 'Paradise of Poetry' which he had created, is matter of controversy. All that is known of his early life is, that when a boy he was very industrious, and also that 'he loved to sit for days alone on the bank of a river.' At the age of between thirty and forty, he went to Gazneh, where Mahmud the Gaznewide, a great admirer and patron of poetry and the arts generally, then resided. Erelong, F. had an opportunity of displaying both his talent and his extraordinary knowledge of ancient Persian history and legendary lore before the sultan himself, who was so pleased with an episode (the story of Sijavush) written by him at his majesty's order, that he at once paid him a gold dirhem for each couplet, and shortly afterwards sent him a great number of fragmentary ancient chronicles and histories of Persia, that he might versify them, and thus carry out the task once attempted by Dakiki—viz., to write a poetical history of the Persian kings from the creation of the world to the end of the Sassanide dynasty (636 A. D.)—the reward to be a dirhem a line. F. spent thirty years over the work, and produced the famous *Book of Kings* (*Shah Nameh*), consisting of 60,000 double lines. Without going so far as many critics have gone, we may fairly rank it among the greatest epics of all nations: the *Iliad*, the *Mahabhârata*, the *Nibelungen*. Truth and fiction, history and fairy lore, all the most gorgeous imagery of the East and its quaintest conceits, together with the homeliest and most touching descriptions of human joy and human sorrow, of valour and of love, the poet has formed into one glowing song. Though abounding—in strict adherence to its sources—in impossibilities and anachronisms (such as Alexander the Great being a Christian, Ki-Khosroo holding the Zend Avesta in his hands—some hundred and twenty years before it was brought to light—Abraham being Zerdusht, &c.), it yet contains not a little that is of real historical value, quite apart from its being the most faithful mirror of its own times. See SHAH NAMEH. But while F. was 'weaving his poetical carpet,' his enemies had not been idle. Unable to attack his genius and his honesty, they attacked his religious opinions; and the sultan, influenced by bigotry and avarice, sent the poet, instead of 60,000 dirhems of gold, so many dirhems of silver. F. was at a public bath when the messenger arrived with the money, and on discovering that it was silver, and not gold, Mahmud had sent him, he divided the amount into three portions, and gave one to the attendant at the bath, another to the messenger, and the third to a man who brought him a glass of sherbet. He then burned several thousand verses which he had written in praise of the sultan, as sequel to the *Shah Nameh*, and composed one of the bitterest satires against him, which he handed over, well sealed, to the king's favourite slave, to give it to him when he might be seized with one of his fits of despondency, as it contained a beautiful panegyric on him. Dreading the sultan's rage, he fled precipitately, first to Tus; persecuted here, he next went to Bagdad, where Kadir Billah, the calif, received him with all honour. But the unrelenting anger of Mahmud followed him thither, and he removed to Tabaristan, which again he had to leave, to seek another place of refuge. After eleven years of restless wanderings, he was at last allowed to return to his native place, a broken, wretched old man. Mahmud is said to have repented his cruelty at last, and to have sent a caravan loaded with the costliest goods to F., to entreat his forgiveness, and induce him to become once more the star of his court. But while the king's messengers entered one gate of the city, F.'s bier was carried out to his last abode by the other, 1020 A. D. (411 H.). His only daughter—an only son of his had died long before him at the age of 37 years—refused the sultan's present, and certain buildings were erected instead, in honour of the dead poet.

The great popularity which the *Shah Nameh* has always enjoyed in the East, is to a certain amount also the cause of the uncritical state of the texts. Every transcriber shaped and moulded certain passages, or even episodes, according to his own fancy, so that not two out of the innumerable copies are quite alike. Nor are the 60,000 couplets extant in any one instance, the utmost number, including all the most palpable interpolations, never exceeding 56,600. The first complete edition of the text, with a glossary and introduction, was published by Turner Macan (Calcutta, 1829, 4 vols.). Another edition, with a French translation, was published by Mohl (Paris, 1840, &c.). Champion published some English extracts in 1788. F. also wrote another poem, *Yusuf and Zuleikha*, which has been edited by Morley, and a *Divan*, or collection of poems. Many European Orientalists have written on F.; among others, Hammer, Wahl, Görres, Schack, Rückert, Morley, Ouseley, Atkinson, Nasarianz, &c.

FIRE. For the superstitions connected with fire, see BELTEIN, NEED-FIRE, and SUN AND FIRE WORSHIP.

FIRE, in Armorial Bearings, is used to denote those who, being ambitious of honour, perform brave actions with an ardent courage, their thoughts always aspiring as the fire tends upwards. A flame of fire is more frequently used as a charge in France and Germany than in this country; but we have fire-balls or bombs, fire-beacons, firebrands, fire-buckets, &c., in abundance.

FIRE, ORDEAL BY. See ORDEAL.

FIRE, ST ANTHONY'S. See ERYSIPELAS.

FIRE AND SWORD. By the law of Scotland, though decree may be given in a civil action against an absent defender, no criminal sentence can be pronounced unless the accused be present. But to resist a criminal citation, is to rebel against the law of the land, and in former times might be treated as treason. In this view, letters of *fire and sword* were occasionally issued by the privy council (Stair, iv. 89). These letters were directed to the sheriff of the county, authorising him to call in the assistance of the country, and to proceed to the extremities which the terrible words fire and sword indicate, should such proceedings be necessary for apprehending the accused party. Lord Stair describes this remedy as the 'last legal execution, warranting all manner of force of arms that is competent in war.' The same course might be resorted to where the decree of a court was resisted; and the object with which letters of fire and sword were more frequently issued than any other, was to enable the sheriff to dislodge refractory tenants who retained possession contrary to the order of the judge, or the diligence of the law. By the modern practice, the judge may, of course, always call in the aid of the military to apprehend an accused party, or to enforce a decree where the ordinary means have proved unavailing.

FIRE ANNI'HILATOR. An apparatus bearing this name was patented by Mr Phillips in 1849, and attracted a good deal of public attention, as it was expected at the time that it would supersede the ordinary Fire Engine (q. v.). The object of this invention was to extinguish fires by pouring into the midst of the conflagration streams of carbonic acid, sulphurous acid, and other gases which do not support combustion. A bottle containing sulphuric acid was placed immediately over a mixture of chlorate of potash and sugar, which, again, was surrounded by a mixture of charcoal, nitre, and gypsum. On breaking the bottle, the sulphuric acid drops upon the chlorate of potash and sugar, which, as is well known to chemists, produces immediately an intense combustion of the sugar; the heat from this fires the surrounding mixture, and dense volumes of the above-mentioned gases are evolved. It is found, however, to be practically of little value in ordinary fires, where the air has free access.

FI'REARMS may be defined as vessels—of whatever form—used in the propulsion of shot, shell, or bullets, to a greater or less distance, by the action of gunpowder exploded within them. They have played so great a part in the world's story, that their invention, development, and science deserve careful analysis. At a more advanced period, an obvious division of the subject into cannon, mortars, and small-arms presents itself; but in the infancy of the invention, and amid the obscurity enshrouding it, we can only seek to inquire into the origin of firearms generally.

The invention of gunpowder bears so directly upon the gradual introduction of firearms, that it will be well to consider the two discoveries concurrently. The widely prevalent notion that gunpowder was the *invention* of Friar Bacon, and that cannon were first used by Edward III. of England, must be at once discarded. It is certain that gunpowder differed in no conspicuous degree from the *Greek fire* of the Byzantine emperors, nor from the *terrestrial thunder* of China and India, where it had been known for many centuries before the chivalry of Europe began to fall beneath its levelling power.

'Nitre,' says Sir George Staunton, 'is the natural and daily produce of China and India; and there, accordingly, the knowledge of gunpowder seems to be coeval with that of the most distant historic events.' The earlier Arab historians call saltpetre 'Chinese snow' and 'Chinese salt;' and the most ancient records of China itself shew that, when they were written, fireworks were well known, several hundred years before the Christian era. From these and other circumstances, it is indubitable that gunpowder was used by the Chinese as an explosive compound in pre-historic times; when they first discovered or applied its power as a propellant, is less easily determined. There is an account of a bamboo tube being used, from which the 'impetuous dart' was hurled a distance of 100 feet: this was at a very early period, but it is difficult to say precisely when. It is recorded, however, that in 618 B.C., during the Taing-off dynasty, a cannon was employed, bearing the inscription: 'I hurl death to the traitor, and extermination to the rebel.' This must almost necessarily have been of metal. We have also curious evidence in regard to the armament of the Great Wall; for Captain Parish, who accompanied Lord Macartney's mission, reported that 'the soles of the embrasures were pierced with small holes, similar to those used in Europe for the reception of the swivels of wall-pieces. The holes appear to be part of the original construction of the wall, and it seems difficult to assign to them any other purpose than that of resistance to the recoil of firearms.' If this surmise be correct, the use of jingalls would be carried back to three centuries at least before the Christian era. Stone mortars, throwing missiles of 12 lb. to a distance of 300 paces, are particularly mentioned as having been employed in 757 A.D. by Thang's army; and in 1232 A.D., it is incontestable that the Chinese besieged in Caïfong-fou used cannon against their Mongol enemies. Thus, the Chinese must be allowed to have established their claim to an early practical knowledge of gunpowder and its effects.

It seems likely, however, that the principles of firearms reached Europe from India rather than China, and that country has equal, if not superior, claims to the first acquaintance with the art. The ancient Sanscrit writings appear to point very plainly to the operation of some primitive sort of cannon, when, in recording the wars of the Egyptian Hercules in India, it is stated that the sages remained unconcerned spectators of the attack on their stronghold, till an assault was attempted, when they repulsed it with whirlwinds and thunders, hurling destruction on the invaders; and a Greek historian of Alexander's campaign testifies that the Hindûs had the means of discharging flames and missiles on their enemies from a distance.

These Indian philosophers seem, from the writings of Ctesias and Ælian, to have also possessed an unquenchable fire similar to that employed later by the Greeks. Passing from these very early times, in which there is reason to believe that some sort of great gun was employed, we come to the comparatively recent date, 1200 A.D., when their use is established beyond a doubt, for Chaséd, the Hindu bard, writes (in stanza 257) that the culivers and cannons made a loud report when they were fired off, and that the noise of the ball was heard at the distance of about ten coss, which is more than three-quarters of a mile. In 1258, the vizir of the king of Delhi went forth to meet the ambassador of Hulaku, the grandson of Genghis Khan, with 3000 carriages of fireworks (in the sense of weapons, probably a sort of rude muskets). In 1368, 300 gun-carriages were captured by Muhammed Shah Bahmiani. The use of cannon had so far advanced in India by 1482, that they were even used for naval purposes; shells having been employed two years earlier by the sovereign of Guzerat. In 1500, the Portuguese had matchlockmen to contend with, as well as heavy ordnance. Pigafetta, in 1511, found the town of Borneo defended by 62 pieces of cannon mounted on the walls. So much for the antiquity, and apparently common use of firearms in China and India, at times long antecedent to any knowledge of them in Europe, and during the period at which they were scarcely developed in an effectual degree. Most of the pieces discovered in India, and supposed to be of early manufacture, are composed of parallel iron bars welded together, and very often they had a movable breech-piece.

The knowledge of gunpowder and firearms may be presumed to have extended in a westerly direction through the Arabs, whom we find using them possibly in 711 A.D., under the name of *manjaniks*, and certainly very early in the 14th century. The Byzantine emperor, Leo, introduced 'fire-tubes' between 890 and 911, for use in connection with Greek fire; and there can be little doubt that these were a species of cannon, probably of small bore. In Spain, both Moors and Christians used artillery as early as the 12th century.

Friar Bacon was conspicuous among his contemporaries for his general learning, and we have no evidence to shew whether he discovered the ingredients of gunpowder independently of foreign aid, or whether he derived the knowledge from some ancient manuscripts; the latter, however, seems the more likely conclusion, as Sir F. Palgrave brought to light in the Bodleian Library a letter from a Spanish friar, Brother Ferrarius, who was a contemporary of Bacon, in which the materials of Greek fire are detailed, differing only in proportions, and in these but slightly, from real gunpowder. That the latter was identified of old with Greek fire, is shewn by the name 'Crake,' applied to the first cannon used. This word, which still survives in 'cracker,' is pointed out by Sir F. Palgrave to be nothing more than a Norman corruption of 'Grec.' Bacon's announcement dates from 1216; but the powder of his time, as made in the West, was not readily explosive, since the materials were but roughly cleared of impurities, and then mixed together on a slab; and probably little use could be made of it as a propellant until the process of granulating had been introduced by Bertholdus Schwartz in 1320. Immediately after this discovery, cannon of small size appeared in the armoury of almost every state, as if their use had been known previously, although no practical effect had been given to the knowledge, on account of the badness of the powder manufactured. These cannon generally consisted of a smaller barrel or chamber to receive the charge, which fitted into a larger one containing the projectile (see fig. 1). It may be safely assumed that these weapons, if terrifying from their noise, were tolerably harmless—at least to the enemy—in their practice. In 1326, the Florentine republic ordered the making of iron shot and cannon for the defence of its villages. In 1327, Edward III. used 'crakeys of war' against the Scotch; in 1339, ten cannons were employed in the siege of Cambray. By 1346, various improvements had been made; and we find in the same year the consuls of Bruges witnessing experiments by one Peter, a tinman, who had constructed a cannon with a square bore, to throw a cubical shot of about eleven pounds; his bolt passed both walls of the town, and unfortunately killed a man on the other side. We have the authority of Villani for believing that Edward III. had three cannon at Crécy; but the cannon then made were, from the little knowledge of casting, limited to about the size of modern duck-guns, and, as has been remarked, three very inferior muskets could have had but little to do with putting 50,000 men to flight.

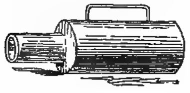


Fig. 1.
From the Santini Manuscripts.

Up to this time, European ordnance had been kept back by the rarity and high prices of sulphur, saltpetre, and iron, the last having been so scarce in England, that it was thought necessary to forbid its exportation by a statute of 28 Edw. III. Still, crude as was their form, and small their number, firearms had established a firm footing in Christendom; their mission of civilisation, and, paradoxical as it may appear, of humanity, had begun. With the first killing discharge, the doom of feudalism had gone forth. Plated armour no longer availed against the weapon of the peasant; and the mailed chivalry, the sinews of previous battles, who had trampled with their iron heels upon popular rights, no longer could carry all before them, but, like other soldiers, were now as loath to be slain by unseen foes as the veriest villein in the host. The people discovered their powers of contending with the noblesse; by degrees, they rose for liberty, and suppressed the tyrannies of the petty lords who had long held them as mere bondsmen. In war, again, as artillery became more general, so the slaughter of battles diminished, for an army outmanœuvred was an army at the enemy's mercy, and therefore beaten; whereas, previously, in the hand-to-hand fights where victors and vanquished mixed pell-mell in single combat, a victory could only be really won when there were no foes left to slay. A battle as great as that at Crécy might now be gained with a loss to the vanquished of not more than 1000 men, instead of the 30,000 who are said to have fallen victims to the English sword or bow.

Dating from the reign of Edward III., the employment of cannon and bombards in siege operations became more or less general. Froissart records that the Black Prince took bombards, cannon, and Greek fire to the reduction of the castle of Romozantin in 1356, but it does not appear that he availed himself of firearms at the battle of Poitiers in the same year. The bombards seem to have been short, capacious vessels, from which stone balls were shot with small charges to a short distance, and at considerable elevation; they were essentially the parents of the present bombs or mortars (see fig. 2). The cannon (*canna*, a reed), on the other hand, were, for some time at least, of extremely small bore, scarcely larger than muskets of the 18th c.; they discharged leaden bullets, and would have probably been used as hand-weapons, but for their cumbrous and heavy workmanship, which necessitated small carriages. Arms of this description are doubtless those referred to as having been brought by Richard II. to the siege of St Malo, to the number of 400 pieces, where they are said to have kept up an incessant fire day and night on the town *without* success.

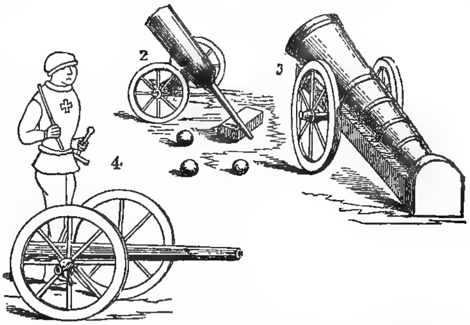


Fig. 2, from the *Chroniques de St Denis,* Fourteenth Century. Fig. 3, Bombard of the Fifteenth Century, from Froissart. Fig. 4, Cannon of the Fifteenth Century, from *Les Vigiles de Charles VII.*

In the 15th c., armies for siege operations were usually accompanied by great and small guns, the latter being intended to keep down the fire of the besieged while the large bombards were being loaded, an operation requiring no small time. These guns were gradually improved, but it was not until the reign of Henry VIII. that the founders succeeded in casting iron ordnance, to the entire exclusion, thenceforward, of cannon formed of square or rounded bars welded together. England had even then become famous for the workmanship of its ordnance. The accompanying sketch (fig. 5) of a gun found in the wreck of the *Mary Rose*, which sunk at Spithead in the above king's reign, will shew that a degree of excellence had been attained in the manufacture of artillery, little inferior to that which has lasted till our own day, when rifled ordnance are rapidly superseding cannon of smooth bores. Still, so late as Henry's reign, although great guns were found very serviceable in siege and naval operations, where the defences of those days offered but a trifling resistance to their power, they appear to have been looked upon rather as an encumbrance than an advantage with armies in the field. This is attributed partly to the heavy character of the guns themselves, and especially of their carriages, but more particularly to the badness, or rather absence, of the necessary roads for their transport. In 1522, it is recorded in the state papers that the 'kinges ordonauns [were] unable to pass over Stanes More towards Carlile.'

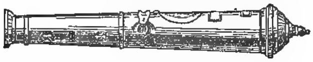


Fig. 5.

As time passed on, the details of the manufacture were improved, the general principles remaining the same; the size of the guns increased, while the proportionate weight of the carriages diminished; limbers (q. v.) were added, and the equipage of a gun gradually perfected and lightened. With increased calibre, to which augmented range was usually added, the number of cannon—at one period enormous—taken with an army was by degrees reduced, until now a certain standard proportion between artillery and infantry is ordinarily maintained. Of course, this proportion differs with the opinions of various commanders; but the greatest modern generals have always acted on the maxim, that it is wasteful to send a soldier on any duty of danger which a ball can be made to perform. As a weapon of offence, Vauban doubted the utility of heavy ordnance when he applied the Ricochet (q. v.) system of firing. Napoleon may almost be said to have won his battles by artillery, for he rarely if ever brought his infantry into action except as supports, until a way had been opened for them, or a panic caused, by the massed fire of large batteries of guns. The Duke of Wellington also devoted the greatest attention to his ordnance-train; while, referring to recent events, the campaign of Lord Clyde in Oude is a remarkable instance of the use of artillery being pushed with abundant success to its greatest limit.

Cannon of widely varying bores have at different times been cast, and the various sorts became so numerous in continental armies, as at one time to cause much inconvenience from the large quantities of ammunition which it was necessary to carry. Gustavus Adolphus set the example of reducing his guns to a few standard calibres, and the same improvement was immediately adopted systematically in the French and other armies. The cannon recently in use in the British army are detailed under the article CANNON; but the action of government has tended for some years to call in all the guns which are not of a few general standards, such as 6, 9, 12, 18, 24, 32, and 68 pounders, and 8-inch guns. These, with the various sizes of Armstrong guns, which have a special sort of ammunition, represent now nearly all the ordnance on the British batteries. For a more particular explanation of the several sorts of cannon and their parts, see GUNNERY, CANNON, CARRONADES, HOWITZER.

The mortar differs from all other guns in its solidity of form, its shortness, and its large bore. The object is the projection of shells by a more or less vertical fire, with the intention of breaking through and destroying, by weight and explosion together, roofs of magazines, public buildings, and so on, or of sinking a shell deep into earthworks of a fortress, in which it shall explode as a most deadly mine. The different sorts of mortar will be described under MORTAR. The mortar arose naturally out of the old bombard, and doubtless deviated by degrees more and more from the cannon. Fig. 6 shews a bombard or mortar designed in the 15th century. In very early days, we read in Arabian authors of a cylinder hewn in the rock at Alexandria, and used as a mortar. Such a cylinder, and of large size, is still to be seen at Gibraltar, where it was employed in the last siege against the Spanish, when it was made to discharge volleys of large stones, which spreading at times to a distance of 500 yards, constituted a formidable means of defence.

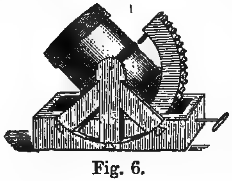


Fig. 6.
From Leonardo da Vinci.

In the British service, the calibre of solid-shot guns is described by the pounds which the shot weigh; in the case of guns for hollow shot or shell, and of mortars, by the inches in the diameter of the bore. In some continental armies, the power of the gun is reckoned by the weight of a *stone* ball fitted to the bore.

A gun is a frustrum of a right cone, with a cylinder (bore) removed around the axis; from which it follows that the thickness of metal is greatest at the breech, where it has to withstand the effect of ignited powder in its most condensed, and therefore most powerful state. Guns are first cast in loam or dry sand, then turned to the required shape, and lastly bored with the minutest accuracy. Formerly, they were cast with the bore already formed; but the direction was rarely exactly correct, and the surface scarcely ever strictly even. Some additional particulars of their manufacture will be given under GUN-FACTORIES, ROYAL; and the science of artillery will be summarised under GUNNERY.

An article on firearms would be incomplete without some allusion to the progress made in small-arms. In the 15th c., the smallest sort of cannon were probably at times mounted and used as hand-guns. From this the step to the arquebus was rapid; that weapon developed as years passed into the clumsy matchlock; that into the firelock and flint-musket; then the percussion-musket; and lastly, into the beautiful rifles of our own day. For diminutives, small arquebuses were made to do duty as horse-pistols; genuine pistols succeeded them; these were gradually improved and reduced in size, till they have culminated in the saloon pistol, available for a waistcoat-pocket; and the deadly revolver, which quadruples a man's defensive power. All these weapons are described under their respective heads—ARQUEBUS, MATCHLOCK, MUSKET, PISTOL, REVOLVER, RIFLE.

Many valuable works have been written on firearms from the days of Leonardo da Vinci and Tartaglia to the present. Among those consulted for this article have been *Etudes sur le Passé et l'Avenir de l'Artillerie* of the Emperor Napoleon III.; *Our Engines of War*, by Captain Jervis; Major Straith's *Treatise on Artillery;* General Chesney *On Firearms*, &c.

FIREARMS, PROVING OF (in Law). In consequence of the frequency of accidents from the bursting of insufficient barrels, the legislature has interfered, not to regulate their manufacture directly, but to prevent all persons from using or selling them until they have been regularly proved in a public proof-house. The first act for this purpose, which was passed in 1813, was soon after superseded by the fuller and more complete one (55 Geo. III. c. 59). By this statute, a fine of £20 is imposed on any person using, in any of the progressive stages of its manufacture, any barrel not duly proved; or any person delivering the same, except through a proof-house; and on any person receiving, for the purpose of making guns, any barrels which have not passed through a proof-house. These penalties are to be levied on conviction before two justices, and the like penalties on persons counterfeiting the proof-marks. The statute does not extend to Scotland or to Ireland, and arms manufactured for Her Majesty, are exempted from its operation. By 10 Geo. IV. c. 38, repealing 6 Geo. IV., the malicious and unlawful use of firearms in Scotland is punishable. See GAME LAWS.

FIREBALLS are projectiles occasionally discharged from guns or mortars, for the purpose either of setting fire to, or of merely illuminating some work, against which hostile operations are directed. The usual ingredients are—mealed powder, 2; saltpetre, 1½; sulphur, 1; rosin, 1; turpentine, 2½; with pitch, tow, naphtha, &c., as circumstances dictate. The use of fireballs has, however, been in great measure superseded by the introduction of rockets (q. v.), and incendiary shells (q. v.). Akin to the fireball, was the *fire-arrow* of ancient warfare, which consisted of tow steeped in pitch, rosin, or some inflammable mixture, wrapped round the shaft, and fired alight among an enemy's works or troops. Greek fire was also discharged in many cases on large arrows surrounded by tow and shot from *balistæ*.

FIREBOTE, the right of a tenant for life or years, according to English law, to cut wood on the estate for the purpose of fuel. See Estover.

FIREBRICK. See Brick.

FI'RECLAY is the variety of clay which is employed in the construction of gas-retorts, glass-pots, firebricks, crucibles, &c., which require to withstand high temperatures. It is found chiefly in the coal measures; and the more famous kind is the Stonebridge, which is found in a bed about four feet thick. It also occurs largely near Glasgow, Newcastle-on-Tyne, and in Belgium and France. The principal constituents of fireclay are silica and alumina, accompanied by small proportions of iron, lime, magnesia, water, and organic matter, as may be observed from the following table:

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Silica, . . .	64·10	51·10	48·55	69·25	83·29
Alumina, .	23·15	31·35	30·25	17·90	8·10
Oxide of Iron, .	1·85	4·63	4·06	2·97	
Lime, . . .	...	1·46	1·66	1·30	1·88
Magnesia, . .	0·95	1·54	1·91		2·99
Organic Matter and Water,	10·00	10·47	10·67	7·50	3·64

Fireclay is found abundantly, near and at the surface of the ground, and is readily reduced to powder by travelling wheels. When kneaded with water, and fashioned into vessels and other articles, it is dried, and is then generally subjected to a strong heat, which drives off the water and organic matter, causes the silica to unite more firmly with the alumina, &c., and leaves a more or less porous material, which can withstand very high temperatures. The Passau crucibles are merely dried, and are not fired like Hessian crucibles and other fireclay wares. The larger the percentage of silica (sand) in the clay, the more refractory are the articles fashioned from it; and hence sand is often added to clay to increase its fusing-point and refractory powers; but a certain proportion of alumina, &c., is required to serve as a flux, to cement and hold together the particles of sand. The proportions of sand and clay are determined by the temperature to which the manufactured article is intended to be exposed; and the fireclay of crucibles or bricks, which are serviceable at a comparatively low temperature, as in the lining of limekilns, would become soft, and yield in glass or porcelain furnaces.

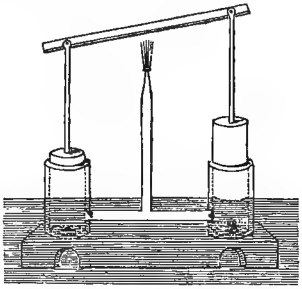
FIREDAMP is the miners' term applied to light carburetted hydrogen or coal-gas when it issues from crevices in coal-mines. See Gas.

FIRE-EATING, a name usually given to a variety of feats performed by jugglers with flaming substances, melted lead, red-hot metal, &c. Evelyn, writing under date October 8, 1672, thus describes fire-eating in his day: 'I took leave of my Lady Sunderland. She made me stay dinner at Leicester House, and afterwards sent for Richardson, the famous fire-eater. He devoured brimstone on glowing coals before us, chewing and swallowing them; he melted a beer-glass, and eat it quite up: then taking a live coal on his tongue, he put on it a raw oyster; the coal was blown on with bellows till it flamed and sparkled in his mouth, and so remained till the oyster gaped, and was quite broiled; then he melted pitch and wax with sulphur, which he drank down as it flamed; I saw it flaming in his mouth a good while; he also took up a thick piece of iron, such as laundresses use to put in their smoothing-boxes, when it was fiery hot, held it between his teeth, then in his hand, and threw it about like a stone; then he stood on a small pot, and bending his body, took a glowing iron with his mouth from between his feet, without touching the pot or ground with his hands; with divers other prodigious feats.' About 1818, Signora Josephine Girardelli, who described herself as the 'original Salamander,' performed astonishing feats of this kind in London and other places in England. According to the accounts of her, 'She commences her performances by passing plates of red-hot iron over her legs; she then stands with her feet naked on a plate of red-hot iron, and afterwards draws the same plate over her hair and across her tongue,' &c. About the same time appeared in Paris M. Chaubert, whose astonishing powers of resisting heat attracted the attention of the National Institute. Among other things performed by this person, was his going into a common baker's oven, with a leg of mutton in his hands, and remaining with the oven closed until the mutton was completely dressed. Another of his performances was standing in a flaming tar-barrel until the whole of it was consumed around him. He subsequently exhibited in London.

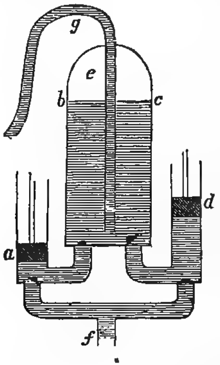
Many of the feats of this kind are undoubtedly mere tricks, or illusions, produced by sleight of hand; others are capable of scientific explanation. There is nothing more wonderful in stuffing blazing tow into the mouth—a common form of mountebank fire-eating—than in eating flaming plum-pudding, or in dipping the finger into spirits and letting it burn like a candle. It is also well known that the tongue, or the hand dipped in water, may be rubbed with impunity against a white-hot bar of iron; the layer of vapour developed between the hot metal and the skin prevents contact and produces coolness (see Spheroidal State of Liquids). Such performances as those of M. Chaubert are explained by the well-known power of the living body to maintain its normal temperature, for a time, independently of the external temperature (see Animal Heat).

FIRE-ENGINE, a machine employed for throwing a jet of water for the purpose of extinguishing fires. This name was formerly applied to the steam-engine. Machines for the extinguishing of fires have been used from a very early date. They were employed by the Romans, and are referred to by Pliny; but he gives no account of their construction. Apollodorus, architect to the Emperor Trajan, speaks of leathern bags, with pipes attached, from which water was projected by squeezing the bags. Hero of Alexandria, in his Treatise on Pneumatics—written probably about 150 years before the Christian era—proposition 27, describes a machine which he calls 'the siphons used in conflagrations.' It consisted of two cylinders and pistons connected by a reciprocating beam, which raises and lowers the pistons alternately, and thus, with the aid of valves opening only towards the jet, projects the water from it, but not in a continuous stream, as the pressure ceases at each alternation of stroke.

The accompanying copy of Hero's diagram explains itself. Little or nothing is known as to the extent to which engines of this kind were practically used. We have accounts of 'instruments for fires,' and 'water syringes useful for fires,' in the building accounts of the city of Augsburg, 1518; and in 1657, Caspar Schott describes a fire-engine used in Nuremberg, which must have been almost identical in construction with that described by Hero. It had a water-cistern, was drawn by two horses, was worked by 28 men, and threw a jet of water, an inch in diameter, to a height of 80 feet. It was not until late in the 17th c. that the air-chamber and hose were added; the first being mentioned by Perrault in 1684, and the hose and suction-pipe being invented by Van der Heide in 1670. In England, hand-squirts were used up to the close of the 16th century. They were of brass, and contained three or four quarts of water. Two men held the handles at the sides, while a third forced up the piston. The nozzle was dipped in a vessel of water after each discharge, then raised, and the water again forced out. So clumsy an apparatus could have been but of little service in the fearful conflagrations to which our old wood-built towns were so subject.



With the addition of the air-chamber and hose, and some improvement in the details of construction, the 'siphons' of Hero became the modern fire-engine. The principle of the action of the air-chamber, and of its connection with the pumps, &c., will be easily understood by the aid of the annexed diagram, where *a* represents in section a piston ascending, *d* the other piston descending, *f* the pipe or hose communicating with the water-supply, *g* the hose that conveys the issuing stream to the fire, *bc* the level of the water in the air-chamber, *e* the space above filled with compressed air. The rising piston raises the water from *f* to fill its cylinder; the descending piston forces the water contained in its cylinder into the bottom of the air-chamber, and thereby compresses the air in *e*. The pistons rise and descend alternately. The compressed air reacts by its elasticity, and pressing upon the surface *bc*, forces the water through the hose *g*. In the space *e*, above *bc*, the whole of the air that formerly filled the chamber is supposed to be compressed. Assuming this to be one-third of its original bulk, its pressure will be about 45 lbs. to the square inch, and this pressure will be continuous and nearly steady, if the pumps act with sufficient force and rapidity to keep the water at that level. As air may be compressed to any extent—and its elasticity is increased in exactly the same proportion —the force that may be stored in the compressed air is only limited by the force put upon the pumps, and the strength of the apparatus.



Under proposition 9 of the same work, in which 'the siphons used in conflagrations' are described, Hero describes and figures the air-chamber as 'a hollow globe or other vessel, into which if any liquid be poured, it will be forced aloft spontaneously and with much violence, so as to empty the vessel, though such upward motion is contrary to nature.' The globe is represented with a single piston attached for compressing the air. Thus, about 1800 years elapsed before proposition 9 and proposition 27 of this work were put together for so obvious and useful a purpose as the fire-engine, although the book was tolerably well known to the mathematicians of the period; and when they were put together, it was probably done by a practical man, who had never heard of the name of Hero.

The more recently constructed fire-engines include contrivances for preventing the entrance of mud and gravel, and for getting readily at the valves in case of their being out of order, while the cistern is dispensed with, a hose being carried directly to the water-supply. They are usually drawn by two or four horses, though smaller engines are made to be drawn by hand or by one horse. The hose is of leather, fastened by metal rivets, instead of the sewing formerly used. In the United States, cotton is woven into a tube by machinery constructed for the purpose. Two such tubes are fitted one within the other, and held together by a solution of India-rubber, which, on consolidating, forms a water-tight layer.

The fire-engines of the London Fire Brigade establishment have usually 7-inch barrels with 8-inch stroke, and throw about 90 gallons of water per minute. Their weight, with implements, firemen, and driver, is about 30 cwt. These are found more convenient for general purposes than larger engines, as they can be drawn at a gallop by two horses for a distance under six miles. Four horses are used for greater distances. When a large engine is required, two of these may be joined together, and throw 180 gallons per minute. The pumps are worked by levers, with long horizontal bars attached, to enable a number of men to work together upon the same pumps. Many larger engines than these have been constructed, and steam has been successfully applied. The first application of the steam fire-engine was made when the Argyle Rooms in London were burned in 1830. Several floating fire-engines for conflagrations near the Thames have been constructed and worked by steam; one of these is capable of throwing 1400 gallons per minute. A floating engine was used with considerable effect when the Houses of Parliament were burned; but at the fire of the warehouses near London Bridge (1861), the fury of the combustion, when at its maximum height, was so great, that the combined efforts of all the London engines, whether worked by steam or by hand, had no perceptible effect in subduing it. For all ordinary fires, the hand-engines above referred to are the most useful, as they can be brought to the spot and set in action immediately, whereas some time must always be lost in getting up the steam, and in bringing to the locality of the fire the larger steam fire-engine. The saving of a few minutes is often of more importance than doubling the quantity of water. These more powerful engines are therefore only likely to be used for great fires, where the smaller engines, after working for some time, are found to be insufficient.

It has been questioned whether, in cases of very intense combustion, a comparatively small stream of water has any subduing effect at all—some assert that it may even increase the conflagration. It appears that carbon, in a state of intense incandescence, is capable of decomposing water by combining with its oxygen to form carbonic oxide; this gas, as well as the hydrogen liberated from the water, is itself combustible; and it is asserted that the heat generated by the combination of these two gases exceeds that which is lost in decomposing the water, and expanding it to the gaseous form. This, however, is doubtful, for the subject has not yet received a sufficient amount of exact investigation to warrant any decided conclusion either way.

For working fire-engines, an organised body of *firemen* are required. In London, the fire insurance companies formerly had separate establishments of fire-engines and firemen; but in 1825 some of them united, and by 1833 all the important companies combined, and the London Fire-brigade was formed, under the management of the late Mr Braidwood, whose death in the discharge of his duties at the great fire just referred to was justly deplored throughout the country as a national loss. The men of the brigade wear a uniform, with strong helmets and metal epaulets, to protect them from the blows of falling beams, &c. They have about twenty stations in the metropolis, with from one to four engines, and a proportionate staff of men at each. The courage and skill of the men in making their way through and about burning buildings, for the purposes of directing the stream from the hose, or for saving life and property, and the general efficiency of the whole organisation, are worthy of the highest praise. Most of our provincial towns now have a fire-brigade upon the same model as that of London. The fact that Paris has seven times as many firemen as London, is a tolerable proof of the amount of work the London firemen are called upon to perform. At Paris, as on the continent generally, the fire-engines and firemen are under government control; and the *sapeurs pompiers*, or firemen, are empowered to enforce the assistance of any people they can find in the streets. As the insurance companies in England pay a fee to the first person who gives notice of a fire at the engine station, there is always a supply of volunteers from among cabmen and people in the streets, besides policemen, to perform this important service; and in like manner the pump-bars of the fire-engines are always fully manned.

In many continental towns, fire-watchmen are stationed in commanding situations, such as church-towers; and their duty is to ring a fire-bell, or otherwise give the alarm, immediately upon observing a conflagration. The fire-companies of the United States are composed of volunteer firemen, who receive no pay, but certain immunities from taxation and militia service. Their annual parade-day is quite a fete. Each company has a special uniform; and in some cities the rivalry among them is so great, that they frequently have desperate fights for the best 'location' for their engines. Prizes are awarded to those whose engines throw a jet of water to the greatest height.

In Constantinople, there are two fire-towers, one on each side of the Golden Horn, with watchmen continually stationed there. A large wicker-ball is hauled up to the side of the tower as a signal, and the cry of 'There is a fire at Scutari, Tophané,' or whatever be the quarter of the city in which it occurs, is raised and taken up by the patrol, who strike the pavement with their iron-bound staves as they repeat the cry. In a few minutes, the alarm is thus spread throughout the whole city. Even though the fire be at Scutari, on the opposite side of the Bosporus, the whole of Constantinople is roused in this manner. The patrol compel the inhabitants to assist in extinguishing the fire; and the method usually adopted is to pull down the houses to the leeward, and thereby isolate the conflagration. According to the old custom, if the fire lasted above an hour, and was three times proclaimed, the sultan had to appear in person, to encourage the firemen and people in the work. This custom is said to have been sometimes the cause of fires, the people taking this method of making their grievances known to the sultan himself. At present, the pasha of the district is summoned in such cases.

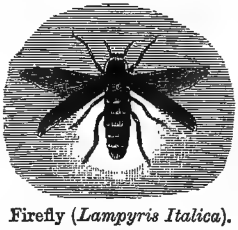
FIRE-ESCA'PES. An immense number of contrivances have been at different times proposed for enabling people to escape by windows and house-tops from burning buildings. They are of two distinct kinds—one for affording aid from outside, and the other for enabling those within the house to effect their own escape. Of the latter, the simplest is a cord that should be firmly attached to the window-sill of every sleeping-apartment, and coiled up either in a box on the floor, or under a dressing-table, or other suitable place. A rope one-quarter or three-eighths of an inch thick, and knotted at intervals of about a foot, is well adapted for the purpose. A good quarter-inch sash-cord will support from three to four cwt. or more if new, and will cost from 6*d.* to 2*s.*, according to the height of the room. A man with tolerable nerve may let himself down by means of such a cord, either by placing his feet against the wall and bringing 'hand over hand' down upon the knots, or by clinging with his feet and knees to the rope as well as with his hands. A man may let down a woman or child by means of a sack at the end of the rope, or simply by fastening them to the end, and letting the rope pass through his hands, aided if necessary by the friction of the window-sill, if it be allowed to bend over it. A rope coiled upon a drum inside a dressing-table, with a winch-handle to uncoil it, is another form. A pulley fixed to the window-sill, over which runs a rope with a chair or simple board to sit on, is a well-known contrivance.

Some means of escape from every sleeping-room should be provided, and the inmates should be thoroughly prepared by knowing beforehand how to act in case of a fire cutting off communication with the usual means of outlet. In a row of houses with projecting balconies, a board of sufficient length to reach from the balcony of one house to the next may be kept in each room, or even a rope might be thrown across with the aid of a stone or lump of coal, &c., tied to one end. An exit by the roof or from the window on to the parapet affords a ready means of escape from a top-story, and should always be provided in tall houses. In case of emergency, when no provision has been made, the cord holding the sacking of the bedstead may be undone, or the bedclothes and curtains tied together to form a rope; or as a last resource, the bedding may be thrown out of window to form a cushion to alight upon in case of the cord or bedclothes being too short to reach the ground; or if there be no time to extemporise such cordage, and it should be necessary to drop directly from the window, in this case, it would be better to hang by the hands from the window-sill and then drop, than to jump direct, as the height of the fall would be somewhat diminished thereby. In all such cases, presence of mind and coolness is of the utmost importance, and may render very simple and slender means of escape more effectual than the most complete and elaborate would be without these qualities; and presence of mind may be to a great extent acquired chiefly by being mentally prepared, and, if possible, by rehearsals of what should be done in case of danger.

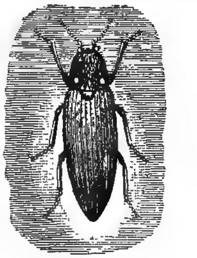
Fire-escapes, to be used from without, consist either of simple ladders kept in churches, police-offices, or other convenient stations, or a series of ladders that can be jointed together; of poles with baskets attached; of ropes with weights at one end, that they may be thrown or shot into windows; of combinations of ladders, ropes, bags, baskets, nets, &c. The fire-escape now generally adopted by the Society for the Protection of Life from Fire is a light carriage or framework on wheels, to which a series of ladders, &c., are attached. It is thus described by the society: 'The main ladder reaches from 30 to 35 feet, and can instantly be applied to most second-floor windows by means of the carriage-lever.' This projects on the opposite side to the ladder like the shafts of an ordinary carriage, and works upon the axle of the wheels as a fulcrum. 'The upper ladder folds over the main ladder, and is raised into position by a rope attached to its lever-irons on either side of the main ladder; or, as recently adopted in one or two of the escapes, by an arrangement of pulleys in lieu of the lever-irons. The short ladder for first-floors fits in under the carriage, and is of the greatest service. Under the whole length of the main ladder is a canvas trough or bagging made of stout sail-cloth protected by an outer trough of copper-wire net, leaving sufficient room between for the yielding of the canvas in a person's descent. The addition of the copper-wire is a great improvement, as, although not affording an entire protection against the canvas failing, it in most cases avails, and prevents the possibility of any one falling through. The soaking of the canvas in alum and other solutions is also attended to; but this, while preventing its flaming, cannot remove the risk of accident from the fire charring the canvas. The available height of these escapes is about 45 feet; but some of them carry a short supplementary ladder, which can be readily fixed at the top, and which increases the length to 50 feet.'

This society has upwards of 70 of these fire-escapes stationed in different parts of London. They stand in the roadway, and are each under the charge of a conductor during the night. Almost every house in London is within two or three minutes' run of one of these. Since 1836, when the operations of the society first commenced, they have saved upwards of 500 lives. At one fire, nine lives were saved by one man and fire-escape. Fire-escapes of similar construction are now stationed in some of our provincial towns. When required, they are run to the burning house, the main ladder standing nearly upright all the while. It is then directed to the required window at a considerable inclination, and the attendant ascends the ladder, and helps the inmates either to descend by it, or if they are unable to do this, he lets them down by the canvas trough, which forms an inclined plane, along which they may easily and safely descend with the aid he is enabled to afford them.

FIREFLY, a name common to all winged luminous insects, at least to all that possess much luminosity. Except the lantern-fly (q. v.), they are all coleopterous, and belong to two nearly allied tribes, *Lampyrides*, to which the glowworm (q. v.) also belongs, and *Elaterides*, to which belong our skipjack beetles, and of which the larvæ are too well-known to farmers as wire-worms. The male glowworm, which alone is winged, has too little luminosity ever to receive the name of F., but the fireflies of the south of Europe (*Lampyris Italica*) and of Canada (*L. corusca*) are nearly allied to it. See GLOWWORM. Fireflies are only seen in the most southern parts of Europe. They abound in almost all the warmer parts of the world, and the brilliancy of the spectacle presented by them when glancing about in numbers amidst the darkness of night, has been often described with enthusiastic admiration. Mr Gosse says of the Canadian F.: 'The light is of a yellow colour, very different from the blue gleam of the English glowworm: from this circumstance I at first took them for candles in the woods, and though told what they were, at every one that appeared, the same idea would come across my mind. . . . They more frequently give out the light while flying, than when crawling or resting, though we may often observe the intermittent gleam as one crawls up a stalk of grass, or rests on the leaf of a tree. They fly slowly, and as they fly, emit and conceal their light with great regularity at intervals of two or three seconds; making interrupted lines of light through the air, gleaming slowly along for about a yard, then suddenly quenched, and appearing again at the same distance ahead. The insect is a pretty beetle, with soft elytra, of a light-brown colour, marked with red, and handsomely striped; the light proceeds from the last three segments of the abdomen, which are of a delicate cream colour by day. At night, these three segments are bright at all times; but at the regular intervals I have mentioned, they flash out with dazzling splendour. If this part be plucked off and crushed, many patches of brilliance occur for a few moments among the flesh, but they gradually die away.' He further describes these fireflies as appearing in great numbers in summer evenings, over wet and marshy ground, millions of them above a river, or over the surface of a large field, like stars on a clear winter night, but flashing and disappearing, and moving about in mazy evolutions.—But still more brilliant are the fireflies of more tropical regions, belonging to the tribe *Elaterides*, as the F. of the West Indies (*Elater noctilucus*), which gives out its light chiefly from two eye-like tubercles on the thorax. The light is so powerful, that the smallest print may be read by it; and this becomes quite easy if a few of the insects are enclosed in a small glass vessel. They are not unfrequently employed—particularly in St Domingo—to give light for household purposes; and they are used for purposes of decoration on festival-days by women, who attach them to their dress or to their hair. One which had been accidentally brought alive to Paris, once astonished and alarmed the Faubourg St Antoine. These insects are caught in some parts of the West Indies—a torch being used to attract them—and brought into houses to destroy mosquitoes, which they eagerly pursue and devour. See LUMINOSITY OF INSECTS.



Firefly (*Lampyris Italica*).



Firefly (*Elater noctilucus*).

FI'RELOCK, the name applied on its introduction, in 1690, to the old musket, which produced fire by the concussion of flint and steel, to distinguish it from the *matchlock* previously in use, which had been fired by the insertion of a lighted match at the powder-pan. Writers of the earlier part of the 18th c. called firelocks 'asnaphans;' a word obviously corrupted from the Dutch *snaphaan*, and leading to the inference that they were brought to England by

William III. and his Dutch auxiliaries. Their first invention is, however, involved in obscurity. The weapon was superseded before 1830 by the percussion musket; which, in its turn, has now yielded to the rifle (q. v.).

FIRENZUOLA, Angelo, an author distinguished for the Attic choiceness of his language, was born at Florence in 1493. Having completed at Perugia the studies which he commenced in Florence, he proceeded to Rome in anticipation of a brilliant legal career, but shortly abandoned the eternal city, disappointed in hope and shattered in health. It seems well authenticated, that he finally enrolled himself among the monkish brotherhood of Vallombrosa, and rose to considerable influence, in spite of the extreme licence of morals, and licentiousness of writing for which he was noted. The date of his death is doubtful, but it is generally placed between 1542 and 1544. His chief works are a spirited paraphrase of the *Golden Ass of Apuleius*—in which he is generally considered by his countrymen to have far excelled the original in nerve and beauty of language; *I Discorsi degli Animali*—containing some sound lessons of just legislation to the ruling powers, the censure being skilfully veiled by means of his animal orators; *I Ragionamenti*, a work in close imitation of the *Decameron* both as regards the impurity of sentiment, and classic purity of language; *Il Trattato della bellezza delle donne*, an eulogistic discussion concerning the charms of the gentle sex, to whom he was inordinately devoted. His works were published in Florence after his death. The best edition is that of Florence (1763, 3 vols.).

FIRE-POLICY. See Insurance.

FIRE-PROOF BUILDINGS. The problem of constructing warehouses, dwelling-houses, &c., that shall be proof against all risk of conflagration, has not yet been solved. The liability to conflagration may be greatly diminished by the construction of a building, but cannot be entirely averted; and therefore, in all 'fire-proof' buildings containing furniture or other combustible materials of any kind, the ordinary precautions against fire should be strictly observed. It is well to state this at the outset, as, unless it be understood, a so-called fire-proof building may be more dangerous than an ordinary one, especially in warehouses, &c., intrusted to the care of watchmen and others, who, relying upon the supposed immunity the name expresses, are liable to neglect many precautions they would not fail to observe in a building believed to be dangerous. The most destructive fire that has occurred in London since 1666 was the recent one at Cotton's Wharf, the warehouses of which were what is called 'fire-proof.' The great fury of this conflagration depended on the nature of the goods that were stored. It is scarcely possible to believe that such combustibles as tallow, turpentine, &c., could have been stored in the vicinity of saltpetre, unless there had existed some faith in their practical isolation from each other by the fire-proof divisions of the building, as it is so well understood that saltpetre, though incombustible of itself, intensifies to an immense extent the combustibility of all combustibles, by supplying them with undiluted oxygen when heated in contact or within a moderate distance of them.

The nearest approximation to fire-proof construction may be obtained as follows: the walls should be of stone or brick, and any ties, lintels, &c., required in the construction should be of iron. The staircases should be of iron or stone, and the floors or landings of tiles, concrete, or stone. Wherever wood is inevitably used, it should be prepared with silicate of soda (see Fire-proofing). Instead of wooden joists to support the floors of each story, arched stone or brickwork should be used, and this should be put together with sufficient care to be independent of the mortar. The roof should be constructed in like manner, wooden rafters being entirely excluded. The doors should be of iron, and the security would be much increased if the doors between any two apartments containing combustible materials were double, with a space between them equal to the thickness of the walls. Of course, it is not practicable to carry out all these precautions in a dwelling-house, but the danger from fire may be considerably diminished by attending to some of them. Wooden staircases are especially dangerous. The most important conditions for a warehouse are, that each apartment shall be separated from the next by stout walls of non-conducting materials, and more especially, that each shall be as nearly as possible air-tight; and whenever, from the nature of the goods, ventilation is required, it should be obtained by periodically opening the doors and windows. If this latter condition is fulfilled, any fire would extinguish itself, unless there be along with the combustible goods some oxygen-giving substance, such as saltpetre, chlorate of potass, or other nitrates or chlorates.

At first sight, it may appear that a warehouse built entirely of iron, would be effectually fire-proof, but this is far from being the case. In the first place, iron conducts heat more readily than any other material used in building; secondly, cast-iron is liable to crack and split when suddenly heated or cooled. Iron supports may, under some circumstances, be even more objectionable than wood, for if the water from a fire-engine were to play upon a heated cast-iron girder, it would probably give way immediately, while a stout wooden beam might be extinguished before being burned through. When buildings supported by iron girders are burning, they are far more dangerous to firemen than those with wood, as the experienced fireman can form a pretty accurate judgment of the time that burning wooden beams will stand, and may move about in their vicinity to direct the stream of water to where it is most needed, but iron girders split and fall without visible notice. It is on this account that floors of arched masonry are recommended above. In great fires, the heat is sufficient to fuse iron.

Without going to the expense of making warehouses and manufactories absolutely fire-proof, certain precautions not of a costly nature might be usefully adopted, for the purpose of merely checking the progress of conflagration until the arrival of fire-engines. Among these simple measures, may be included iron doors hinged on stone between different departments; a sufficient deafening not easily destructible between the ceiling of one story and the floor of that above; and stone stairs. For rendering timber difficult of combustion, see Fire-proofing.

FIRE-PROOF SAFES AND REPOSITORIES are used as receptacles for deeds, paper-money, account-books, and other valuables. They are now regular articles of commerce, and are to be found in almost every counting-house, lawyer's office, jeweller's or watchmaker's shop or warehouse, and are indispensable to banking and such-like establishments. Our forefathers used oaken chests secured with iron straps and studs for similar purposes. That which formerly contained the crown-jewels of Scotland, and is still exhibited in Edinburgh Castle, is a good example. Subsequently, iron chests made simply of stout cast or wrought iron were used.

The modern safe has double walls and doors of stout iron plates, and the space between the plates is filled with some substance that shall resist the transmission of the heat which would be readily conducted through solid iron. The materials used for these linings are very various—sand, dried clay, charcoal, ashes, bone-dust, alum, gypsum, &c. The safes of Messrs S. Mordan & Co., which are largely used by bankers, are lined with a mixture of equal parts of saw-dust and alum. Some makers include small vessels containing liquids, the vessels burst when heated, and the liquids exert some cooling effect. Alum acts in nearly the same manner. It contains 24 equivalents of water, or nearly half its weight. At 212°, ten equivalents are driven off in vapour; at 248°, ten more; and at 392°, the four remaining equivalents are volatilised. It is a mistake, however, to suppose that any of these linings can render such a safe really fire-proof; and this is admitted by the more scrupulous manufacturers, who carefully abstain from using the designation of 'fire-proof,' but apply that of 'fire-resisting,' which honestly describes all that they are capable of doing, as they may resist the action of fire for a considerable time; but whether or not their contents may be ultimately preserved from a fire, is simply a question of the duration and intensity of the heat to which they are exposed. Their great weight in some cases assists in preserving them, especially when on an upper floor, as such a safe would be the first thing to break through the burning joists and descend to the lower part of the building, where the fire is usually the most smothered. These safes are sometimes let into recesses of stout masonry, built on purpose, and protected by an additional double iron door. This, of course, adds greatly to their security. All such safes should of course be secured by the best locks that can be made, protected by every possible precaution against picking, blowing up by gunpowder, or other violence. See LOCKS.

FIRE-PROOFING. Attempts have continually been made to render cotton, linen, and other textile fabrics, timber, &c., incombustible; but at present they have been but partially successful. There are many means by which fabrics may be prevented from flaming, their combustion being reduced to a slow smouldering; and the many recent cases of fatal results from the present extravagant dimensions of ladies' dresses have rendered the adoption of some such protection against fire very desirable. By moistening the fabric with a solution of any saline substance, which, upon drying, will leave minute crystals deposited in or between the fibres, its inflammability will be greatly diminished, but the salt imparts a degree of harshness to the fabric, and in many cases weakens the fibres. Alum, sulphate of zinc, and sulphate of soda have been used, and are effectual to prevent flaming, but they weaken the fibre. Common salt does the same. Phosphate and sulphate of ammonia are less objectionable on this account, but the former decomposes by contact with the hot iron in ironing. Tungstate of soda has been proposed, and is said to have no injurious effect on the fibre. Sulphate of ammonia, chloride of ammonium (sal ammoniac), and borax, are among the best fitted for domestic use, though they are not unobjectionable. For made-up clothing, borax is, perhaps, the best, as it is most effectual in its action, and is the least injurious to the appearance of the article, though it is stated to have some weakening effect on the fibre; this, however, is only perceptible in case of a tearing strain, and will not perceptibly damage such articles as ladies' under-clothing, or anything else only subject to ordinary wear. Wood has been treated in a similar manner. Milk of lime, alum, sal ammoniac, sulphate of ammonia, chloride and sulphate of zinc, sulphuret of lime and baryta, &c., have been used, and its *inflammability*, but not its *combustibility*, is destroyed. Like the fabrics, when similarly treated, wood smoulders slowly. The most efficient protection to wood is silicate of soda. If planks of moderate thickness be brushed three or four times over, on each side with a strong solution, they are rendered almost incombustible; they will only burn when very intensely heated. The silicate fuses and forms a glass which envelopes the surface, and even the internal fibres of the wood, if it be sufficiently saturated, and thus seals it from the oxygen of the air.

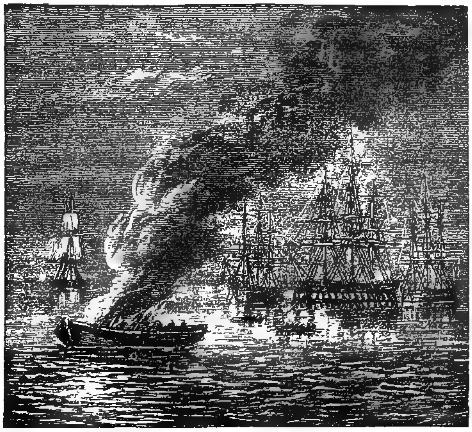
FIRE-RAISING, in the law of Scotland, is the equivalent term for Arson (q. v.) in England. If any part of a tenement, however small, has been set fire to wilfully, this crime has been committed. It is quite indifferent where the fire has commenced, and the offence is frequently perpetrated by setting fire to furniture, or to other objects either within or without a house; but it is not regarded as completed, and is punished as a separate crime, of which we shall speak afterwards, unless the fire has communicated itself to some part of a building. If the fire originated in carelessness, however gross, it is not wilful fire-raising, but a minor offence, punishable with fine and imprisonment. But if the intention was to injure the proprietor of a tenement by burning, not his house, but an object in its neighbourhood—e. g., a haystack—and the fire was accidentally communicated to the house, the offence is the same as if the fire had been applied to the house directly. The infliction of capital punishment for the offence of fire-raising is now in desuetude. Where a man burns his own house without endangering the life of any one, he has not committed the crime of fire-raising, but he may be punished criminally, if the act was done for the purpose of defrauding the insurers. Till recently, it was the rule in Scotland, that where fire was the result of inevitable accident, it freed a carrier or innkeeper from responsibility for any goods that were destroyed in his custody, unless where fraud or collusion could be shewn; but the law in this respect has been altered by the Mercantile Law Amendment Act, 19 and 20 Vict. c. 60, which provides, s. 17, that after the passing of the act (1856), 'All carriers for hire, of goods within Scotland, shall be liable to make good to the owner of such goods all losses arising from accidental fire while such goods were in the possession or custody of such carriers'—thus equalising the law of Scotland with that of England.

Attempting to set fire to houses, crops, &c., is a distinct crime from Arson (q. v.), or the actual destruction of property by fire. By 9 and 10 Vict. c. 5, it is enacted, that if any one shall attempt to set fire to a house, &c., with such intent that the offence, if committed, would be felony, and liable to be transported for life, he may be transported for fifteen years (now penal servitude), or imprisoned for two years. The attempt to burn growing crops of corn, &c., is a felony by 7 and 8 Geo. IV. c. 30, and punishable by transportation for seven years, or by imprisonment. These offences are also misdemeanours at common law. By 24 and 25 Vict. c. 97, s. 8, the attempt to set buildings on fire is punishable by penal servitude for fourteen years, or imprisonment for two years; if a male under sixteen, to be whipped.

In Scotland, an attempt to commit wilful fire-raising (q. v.) is an offence at common law. It is not necessary to constitute this offence that the fire should have consumed any part of the building, &c. Furniture—as a mattress—partly consumed, a lighted peat thrust under a stack without igniting it, are sufficient to warrant a conviction. Inciting others to commit fire-raising is an indictable offence; and, in some old cases, persons have been punished for the mere threats to commit the offence, without being guilty of any overt act.

The English Act 9 and 10 Vict. c. 25, declares that whoever shall maliciously, by the explosion of gunpowder or other explosive substance, destroy or damage any dwelling-house in which there is any person at the time, is guilty of felony, and shall be subjected to transportation for life, or not less than fifteen years, or to an imprisonment not exceeding three years. Blowing up a building with intent to murder, and thereby endangering life, or casting upon any person any explosive or corrosive fluid whereby grievous bodily harm is occasioned him, and similar offences, are declared subject to the same punishment. Attempting any of these offences subjects the perpetrator to a minor punishment. The manufacturing or having in possession any explosive substance, or dangerous or noxious thing, or any machine or instrument for the purpose of committing any of the above offences, is a misdemeanour, liable to imprisonment not exceeding two years. Male offenders under eighteen years of age, convicted under the act, may be whipped.

FIRE-SHIP, a vessel, usually an old one, filled with combustibles, sent in among a hostile squadron, and there fired, in the hope of destroying some of the ships, or at least of producing great confusion. Livy mentions the use of such by the Rhodians, B.C. 190; but among the first occasions in modern times when they are known to have been employed, were by the Dutch in the Scheldt during the War of Independence in the Netherlands, and, shortly after, by the English in 1588, against the Spanish Armada. The Chinese tried them against the British fleet before Canton in 1857, but unsuccessfully. The service of navigating one of these ships into the midst of an enemy, there firing it, and then attempting to escape, is always fraught with great risk of failure and disaster.



Fire-Ship.

FIREWORKS. See Pyrotechny.

FIRE-WORSHIPPERS. See Guebers.

FIRISHTA, Mohammad Kasim Hindu Shah, a celebrated Persian historian, born towards the end of the 16th c. (1570?), at Astrabad, on the Caspian Sea. At a very early age, he went with his father (Gholam Ali Hindu Shah) to India, where we find him, when twelve years old, at Ahmednuggur, in the Deccan, sharing the instruction which the latter gave to Prince Miran Hussein Nizam Shah. He afterwards became captain in the body-guard of Murteza Nizam Shah; and when this king was deposed by his own son, F.'s former fellow-student —who, in his own turn, was deposed and murdered in less than a twelvemonth afterwards—F. went to Bijapore (998 H., 1589 A.D.), where Ibrahim Adil Shah II., the reigning monarch, received him with great honour. He also appears to have conferred a military rank upon him, as, soon after his arrival, F. is mentioned as taking part in an action against Jumal Khan, in which he was wounded and taken prisoner, but ere long he made his escape. His death is supposed to have taken place shortly after the year 1612. His great work is the *Tarikhi Firishta*, or History of the Mohammedan Power in India, which he finished in 1018 H. (1609 A.D.). Twenty years were spent in its preparation, and the number of books used for, and partly embodied in it—special histories of certain periods and provinces—amounts, according to F. himself (Introduction), to thirty-five; but twenty others besides these are quoted in the course of the work. It consists—besides a preamble or introduction on the Progress of Mohammedanism in India, and a final treatise on the geography and the climate of India—of 12 divisions, treating of the kings of Ghizni and Lahore, Delhi, the Deccan, Guzerat, Malwah, Candeish, Bengal and Behar, Mooltan, Sinde, Cashmere, Malabar, and of the saints of India. Written with an impartiality, simplicity, and clearness rare in an Eastern work, this history has become a standard work on the subject, into which it was the first to enter at length. Single portions of it have been translated by Dow, Scott, Stewart, Anderson, &c.; but the whole work, edited first by J. Briggs (Bombay, 1831, fol. 2 vols.), was also translated by him (London, 1832, 8vo, 4 vols.). A fuller account of F.'s life and writings, by the same, will be found in the second volume of the Transactions of the Asiatic Society.

FI'RKIN (dim. from *four*, the fourth part of a barrel), an old measure of capacity containing nine gallons (old ale and beer measure). But previous to the year 1803 it had two values, being estimated at eight gallons in old ale measure, and at nine in old beer measure. The firkin is equivalent to $9\frac{1}{7}$ imperial gallons. See Gallon.

FI'RLOT (according to Jamieson, from Ang.-Sax. *feorth* and *lot*, the fourth part), an old Scotch dry measure, of which there were four in a Boll (q. v.). Though differing in value for different substances and places, its relation to the boll remained invariable. See Peck.

FIRM. See Partnership.

FI'RMAMENT, a word in use of old to signify the vault of heaven. The term found its way into English from the Vulgate, which renders the Septuagint *Stereoma*, and the Hebrew *Rakia*, by the Latin *Firmamentum* (Gen. i. 6). Rakia (from the verb *raka*, to beat or strike out) signifies whatever is expanded or stretched out, and was specially employed by the Hebrews to denote the hemisphere above the earth, compared (Exod. xxiv. 10) to a splendid and pellucid sapphire. Elsewhere (Ez. i. 22–26) it is spoken of as the 'floor' on which the throne of the Most High is placed. Hence it follows that the notions of solidity and expansion were both contained in the Hebrew conception of the firmament. The blue ethereal sky was regarded as a solid crystal sphere, to which the stars were fixed (compare the *cœlo affixa sidera* of Pliny, ii. 39 and xviii. 57), and which was constantly revolving, carrying them with it. This sphere or firmament divided 'the waters which were under the firmament from the waters which were above the firmament;' and the theory of the phenomena of rain, &c., was, that there were 'windows in heaven'—i. e., in the firmament, through which, when opened, the waters that were above the firmament descended. 'The same day were all the fountains of the great deep broken up, and the windows of heaven were opened,' Gen. vii. 11. The view entertained by the Greeks, and other early nations, was essentially the same. In the progress of astronomical observations, it was found that many of the heavenly bodies had independent motions, inconsistent with the notion of their being fixed to one sphere or firmament. Then the number of crystalline spheres were indefinitely increased, each body that was clearly independent of the rest having one assigned to it, till a complex system was introduced, capable of being fully understood only by the philosophers who formed it. See PTOLEMAIC SYSTEM. It was long before men formed the idea of the possibility of a body being maintained in motion in space without a fixed support, and considering the number of phenomena of which the hypothesis of a crystalline firmament offered an apparent explanation, we must regard it as having been in its day a curious and ingenious speculation.

FI'RMAN, a word of Persian origin, signifies an order, and is used by the Turks to denote any official decree emanating from the Ottoman Porte. The right of signing any firman relating to affairs connected with his special department is exercised by every minister and member of the divan, but the office of placing at the head of the firman the *thograï*—a cipher containing the name of the sultan in interlaced letters, and which alone gives effect to the decree—is committed to the hands of a special minister, who is called *nichandji-effendi*. The name applied to such decrees as have been signed by the sultan himself is *hatti-sherif*. The name firman may also signify a more formal kind of Turkish passport, which can only be granted by the sultan or by a pasha.—A written permission to trade is called in India a firman.

FIRST-BORN (Heb. *Bekor*, Gr. *prototokos*, Lat. *primogenitus*), in scriptural use, signifies the first male offspring, whether of man or of other animals. By a principle of the Mosaic law, and indeed of the common law of nature, it was established that the firstlings of all the produce of creatures, whether animate or inanimate, were in some sense due to the Creator as a recognition of His supreme dominion. See FIRST-FRUITS. Under the title arising from this recognition are to be classed many observances regarding the first-born of animate beings, whether rational or irrational, which prevailed among eastern nations generally, or which are specially established by the Mosaic law: 1. The first-born male, whether of men or of animals, was devoted from the time of birth to God. In the case of first-born male children, the law required that, within one month after birth, they should be redeemed by an offering not exceeding in value five shekels of silver (Exod. xiii. 13). If the child died before the expiration of thirty days, the obligation of redemption ceased; but if that term were completed, the obligation was not extinguished by the subsequent death of the infant. This redemption took place according to a fixed ceremonial. The first-born male of animals also, whether clean or unclean, was equally regarded as devoted to God. The first-born of clean animals, if free from blemish, was to be delivered to the priests within twelve months after birth, to be sacrificed to the Lord (Deut. xv. 21); nor was it permitted to any but the priests to partake of the flesh of such victims (Num. xviii. 18). If the animal were blemished, it was not to be sacrificed, but to be eaten at home (Deut. xv. 22). The first-born of unclean animals, not being a fit subject for sacrifice, was either to be put to death, or to be redeemed with the addition of one-fifth of its value (Lev. xxvii. 27; Num. xviii. 15). If not redeemed, it was to be sold, and the price given to the priests. 2. Primogeniture, both by the patriarchal and by the Mosaic law, had certain privileges attached to it, the chief of which were the headship of the family, and a double portion of the inheritance. Before the time of Moses, however, it was in the power of the father to decide which among all his sons should be considered the first-born. Moses ordained that the right should invariably belong to the first-born in point of time.

Among other nations, considerable variety existed as to the succession of children to the inheritance of their parent. The Greeks, especially the Athenians, excluded the females of a family so rigorously from the inheritance, that in the event of a father dying intestate and without heirs-male of his body, the nearest male kinsman succeeded to the estate. The later Romans, on the contrary, placed daughters on the same footing with sons as to the division of intestate property. The Mohammedans gave the daughters a certain share of the father's estate, but only one-half of that assigned to the sons. All the nations of Germanic descent restricted the succession, especially in land, to heirs-male. But the Visigoths in Spain admitted females, except in certain contingencies.

The rights of the first-born in English and Scotch law are noticed under SUCCESSION, PRIMOGENITURE, &c. In France, the law of primogeniture fell at the Revolution, in common with many other relics of the feudal system. How far the results of the change have been beneficial, is still a moot-question among political economists. In the state of Virginia, also, after the American revolution, a similar change took place; and that the change has been in accordance with public opinion in that state may be inferred from the fact, that a parent now commonly makes, by will, the same disposition of his property as that which would be provided by the law itself in the case of his dying intestate.

FIRST-FRUITS (Heb. *reshith*, Gr. *protogennemata* and *aparchai*, Lat. *primitiæ*), that portion of the fruits of the earth and other natural produce, which, by the usage of the Jews and other ancient nations, was offered to God, as an acknowledgment of His supreme dominion, and a thanksgiving for His bounty. Among the Jews, the institution of first-fruits comprised both public and private offerings.

Of the former class, there were three principal offerings: the first was at the opening of the corn-harvest. On the day after the Passover Sabbath, the 16th of the month Nisan, a sheaf of new corn, which was cut and gathered with much solemnity, was carried to the Holy Place, and there waved before the altar (Lev. xxiii. 5 and foll.); nor was it permitted to commence the harvest-work till after this solemn acknowledgment of the gift of fruitfulness. Again, at the Feast of Pentecost, two loaves of leavened bread, made from the flour of the new harvest, were waved, with a similar form of worship, before the altar (Ex. xxxiv. 22). Thirdly, at the Feast of Tabernacles, in the 7th month, was held the great feast of the gathered-in harvest, the final acknowledgment of the bounty of God in the fruits of the year (xxiii. 16).

Besides these public offerings of first-fruits on the part of the entire people, individual Jews were bound to private offerings, each upon his own behalf. 1. A cake of the first dough of the year was to be offered to the Lord (Num. xv. 21). 2. The 'first of all the fruits' were to be placed in a basket, and carried to the appointed place, where the basket was to be offered with a prescribed form of words, commemorative of the sojourn of Israel in Egypt, and of his deliverance by the strong hand (Deut. xxvi. 2 and foll.). All these offerings were divided into two classes—the first, which were called *Bicurim*, comprised the various kinds of raw produce, of which, although the law seems to contemplate all fruits, seven sorts only were considered by the Jewish doctors to fall under the obligation of first-fruit offering—viz., wheat, barley, grapes, figs, pomegranates, olives, and dates. The law lays down no rule as to the quantity of the first-fruit offering; and it would be tedious to enter into the many questions regarding it which have been raised by the commentators. It was customary for the offerers to make their oblations in companies of twenty-four, and with a singularly striking and effective ceremonial.

The second class of first-fruit offerings were called *Terumoth*, and comprised the produce of the year in the various forms in which it is prepared for human use, as wine, wool, bread, oil, date-honey, dried onions, and cucumbers. As to the quantity of these offerings, and the persons on whom the obligation fell, there are many discussions, for which we must refer to the biblical authorities.

Under the kings, and again after the captivity, much laxity crept into the observance of this practice, which Nehemiah laboured to revive in its primitive exactness. Offerings analogous to the Jewish first-fruits became usual very early in the Christian Church, as is clear from a passage in Irenæus (*Adv. Hær.*, b. iv. c. 17 and 34); but the extent to which it prevailed, and the amount and general character of the oblation, are exceedingly uncertain. It appears to have been merged in the legal provision established by the emperors.

The medieval ecclesiastical impost known under the name of *primitiæ*, or first-fruits, and sometimes of *annates* or *annalia*, was entirely different. By the word, in its medieval and modern sense, is meant a tax imposed by the popes on persons presented directly by the pope to those benefices which, by the canonical rules, or in virtue of privileges claimed by them, fall within the papal patronage. Persons so presented were required to contribute to the Roman see the first-fruits (that is, the income of the first year) of their benefice. During the residence of the popes at Avignon, when the papal necessities compelled the use of every means for eking out a precarious revenue, the impost was sought to be extended to every benefice; and this claim was the subject of many contests, especially in Germany and in England, where the claim, so far as regarded direct papal presentation, had existed from the reign of King John. Henry VIII., by two successive statutes (25 Henry VIII. c. 20, and 26 Henry VIII. c. 3), withdrew the right of first-fruits from the pope, in order to transfer it to the king; and he established a special court for the administration of first-fruits, which, however, was soon disused. In the reign of Anne, the revenues arising from this impost in England were vested in a Board, to be applied for the purpose of supplementing the incomes of small benefices (2 Anne, c. 11). A similar change was introduced in Ireland by the 2 Geo. I. c. 15; but in the latter kingdom the payment was entirely abolished by the 3 and 4 Will. IV. c. 27. In France, this tax was abolished by the 'Pragmatic Sanction' enacted at Bourges in 1438, and subsequently by the *Concordat* of Leo X. with Francis I. in 1512. In Spain, it ceased partially in the reign of Ferdinand and Isabella, and finally under Charles V. In Germany, it formed one of the first among the *Centum Gravamina* presented to the emperor in 1521, and the claim ceased altogether from that period.

FIRTH. See Frith.

FISCHART, John, a very extraordinary German author, was born either at Mainz or Strasburg, probably about the year 1545. Regarding his life, we know very little. He was by profession a jurist, but his writings exhibit an immense learning and reading in all the departments of human knowledge. About 1570, he made a journey to England. Towards 1580, he was living at Strasburg in terms of close friendship with the eminent book-printer, Bernhard Jobin. During 1581 and 1582, he was advocate to the Imperial Chamber at Speier, and in 1585 became bailiff of Forbach, where he probably died about 1590. Of the very numerous writings which appeared 1570—1590, partly under his own, and partly under various fictitious names, about fifty have been proved to be on the whole genuine, though disfigured by interpolations. In respect to others, however, the authorship is doubtful. The original editions of almost all F.'s works are extremely rare, but new ones have recently been published. His most celebrated works are based on foreign models, particularly Rabelais, but there is no servile imitation manifested: a free creative genius works plastically on the materials. To this class belong his *Aller Praktik Grossmutter* (1573), *Assentheurlich Naupengehörliche Geschichtklitterung von U. S. W.* (1575), *Podagrammisch Trostbüchlein* (1577), *Binenkorb des Heyl. Römischen Imenschwarms* (1579), and *Der Heilig Brotkorb* (1580). These writings are wholly satirical. With the most inexhaustible humour, he lashes, now the corruptions of the clergy, now the astrological fancies, the dull pedantry, or other follies, public and private, of the time. Next to these stands the outrageously comic work of F.'s—quite original in its conception—entitled *Flöhatz, Weibertratz* (1574). Essentially different in its homely and simple tone is his *Das glückhafft Schiff von Zürich*, written in verse, and published in 1576 (new edition by Halling, 1829). Similar in point of style are his *Psalmen und Geistliche Lieder* (1576; new edit. Berlin, 1849). The rest of F.'s numerous writings, partly in prose, partly in verse, are of unequal merit, singularly varied in style and contents; the prose works being in general more complete than the poetic. What gives so high a value to F.'s satirical humour, is the warm and genuine feeling which he exhibits for the moral foundations of all public and private life—viz., religion, 'fatherland,' and the family, a feeling which betrays itself in his wildest mirth. His works are, moreover, one of the richest sources from whence to draw information with regard to the manners of his time. But perhaps the most extraordinary thing about F. is his treatment of the language. No German author can be compared with him, not even Jean Paul Richter himself. He coins new words and turns of expression, without any regard to analogy, but nevertheless displays the greatest fancy, wit, and erudition in his most arbitrary formations. The fullest collection of his writings is in the Royal Library at Berlin. For a critical account of the investigations concerning

F. and his works, see Volmar in Ersch and Gruber's *Encyclopædie* (s. 1, vol. 5).

FISH, a naval term of various application. The *fish* is an apparatus of pulleys employed in dragging the flukes of the anchor towards the bow after it has been hoisted to the cat-head.—*Fish-front*, or *paunch*, is a long piece of oak, or fir, convex without, concave within, securely fastened on the injured portion of a sprung mast or yard, to which it imparts rigidity. *Side-fishes* are long pieces of timber dove-tailed on the opposite sides of a made mast, to give it a circular form and the requisite diameter.

FISHER, John, Bishop of Rochester, was born in 1456 at Beverley, in Yorkshire, educated at Michael House College (now incorporated with Trinity College), Cambridge, where he took his degree in 1491, and of which he became master in 1495. Margaret, Countess of Richmond, mother of Henry VII., charmed by the report of his virtues and learning, next appointed him her chaplain and confessor. In 1501, he was elected chancellor of the university; and in 1502, became first Margaret Professor of Divinity. Two years later, he obtained the bishopric of Rochester. For many years after this appointment, he laboured diligently for the welfare of the church and the universities. The Reformation of Luther found in him—as might have been expected from his devout ecclesiasticism—a strenuous, if not an able opponent. In 1527, a rupture took place between him and Henry in regard to the divorce of Queen Catharine. F. refused to declare the marriage unlawful. From this period, he figures in the politico-religious strifes of his time as a stanch adherent of the papacy. He opposed the suppression of the lesser monasteries in 1529, and the acknowledgment of Henry as head of the church in 1531, and thereby excited the dislike of the party of progress in the English nation. His credulity—many would apply a harsher term—in reference to Elizabeth Barton (q. v.), the 'Holy Maid of Kent,' involved him in a still more perilous antagonism to the king. He was imprisoned; and on refusing to take the oath affirming the legality of Henry's marriage with Anne Boleyn, he was committed to the Tower, April 26, 1534, where he was treated with great barbarity. A kind but inconsiderate act of Pope Paul III. now hastened the destruction of the old man. His Holiness, as a reward of his faithful services, sent him a cardinal's hat in May 1535. When Henry was informed of this, he exclaimed: 'Mother of God, he shall wear it on his shoulders, then; for I will leave him never a head to set it on.' His ruin was now certain. He was accused of high treason, and after a brief trial, was condemned, and executed, 22d June 1535. F. was one of those unfortunate persons who, with abundance of personal virtues, find themselves opposed to the overwhelming tendencies of the times in which they live.

FISHERIES. The capture of various kinds of fish for the purpose of trade has always been extensively carried on in maritime countries, and in those which are watered by large rivers; and has been the means in many instances of adding greatly to their prosperity. In Great Britain and Ireland, especially, this pursuit affords remunerative employment to a large proportion of the population, and forms an unequalled nursery for sailors to recruit the royal navy.

The art of capturing fish, like other arts, has been brought only by degrees to its present perfection. In remote ages, fish were caught in the rudest manner by men who lay on the rocks, ready to shoot them with arrows, or transfix them with spears. Even yet, in places which are only partly civilised, fish are taken with blankets or sheepskins; and a roughly made spear, known as a leister, is still used in the country districts of the United Kingdom in the illegal capture of salmon. Advancing intelligence, however, and the use of fish as an article of barter for other kinds of food, soon led to more effective modes of capture. Persons who dwelt on the sea-coast began to exchange fish for animal food killed by the inland hunters, and in this way initiated a commerce which is now represented by a vast amount of capital and enterprise.

The importance of fisheries, as bearing on the food-supplies of nations, inland as well as maritime, and as forming a remunerative outlet for labour, can scarcely be overestimated, more especially as fish has ever been in the greatest demand by all classes of the people, and has been in use for human food from the most remote periods. Previous to the Reformation, it was in universal demand in Britain, being the prescribed diet during the fasts appointed by the church.

One great peculiarity of this source of wealth is that, with slight exceptions, the sea-harvest (if we may so call it) is ripened, without trouble or expense for the fisher, who only requires to provide the means of gathering it; and that, under certain regulations, it is free to all comers. River fisheries, except in the case of salmon, are, so far as commerce is concerned, comparatively unproductive in Great Britain; and Lochleven is the only British freshwater lake the produce of which is worth mentioning. But the great continental rivers abound in excellent fish, which in the aggregate are of very considerable value.

The principal fisheries of Great Britain are those connected with the capture of salmon, herring, shellfish, cod, soles, turbot, mackerel, &c. Immense quantities of these fish are in constant demand, and the various lines of railway, that branch inland from the coast, afford a rapid means of transit, and have in consequence considerably enhanced the value of sea-produce, which in former years was lost for want of a sufficiently rapid conveyance to those seats of population where it would have found a ready sale. In fact, it is affirmed by those who have studied the subject, that the increased demand for fish, consequent upon the increased facilities for its transit, has so affected the fisheries as to render them less productive than formerly, when the demand was more limited.

It is difficult to obtain reliable statistics of the different fisheries, as, excepting the government Board for Scotland, there is no recognised authority on the subject. The following figures, bearing on the herring-fisheries of Scotland, which are the most important of the fisheries of the United Kingdom, are taken from official returns made by the commissioners for the fishing of 1860. The total quantity of herrings cured during that year was 681,193¼ barrels; the total quantity branded, 231,913½ barrels; and the total quantity exported, 377,970½ barrels; being an increase over the preceding year of 189,706 barrels in the quantity cured, of 73,237½ in the quantity branded, and of 104,991 in the quantity exported. From the fishery statistic accounts, we find that, in the year 1860, 12,721 boats, manned by 42,430 fishermen and boys, were engaged in the herring, cod, and ling fisheries of Scotland and the Isle of Man; and that the total estimated value of the boats, nets, and lines employed in these fisheries during the same period was £750,196. The greater portion of the herrings are salted or cured, and in this state they are sold in very large quantities, not only in Great Britain, but in her colonies and in other foreign countries. At Hamburg and other continental seaports, there are merchants who deal largely in cured herrings, and employ agents to visit the various British ports, in order to secure a supply. Accurate statistics of the quantity of herrings which is annually cured in Scotland may be consulted in the various returns of the Fishery Board. The following figures represent the number of barrels cured annually for the last ten years: 1852, 498,788; 1853, 710,344; 1854, 636,532; 1855, 766,703; 1856, 580,000; 1857, 550,000; 1858, 630,000; 1859, 500,000; 1860, 637,000; 1861 (supposed), 680,000.

The principal seats of the herring-fishery in Great Britain are at Wick, in Caithness-shire, Scotland, and at Yarmouth, in England; but it is also carried on in many places along the coast. The annual consumption of herrings in London will give a good idea of the total quantity of that fish required for general consumption throughout the kingdom. Upwards of 300,000 barrels of fresh herrings, of 700 fish to each barrel, are annually used in the great metropolis, 265,000 baskets of bloaters, of 150 fish per basket, and not less than 60,000,000 of red herrings. Large quantities of the pilchard and of the sprat are also consumed, the annual value of the latter being estimated at upwards of £100,000.

A visit to Billingsgate affords the best means of obtaining a proper notion of the food-wealth of the sea. Here tons upon tons of all kinds of fish are daily distributed. The average quantities per annum of white fish estimated to have passed through Billingsgate in the course of the last five years are as follows: Haddocks, 3,000,000; whitings, 18,500,000; soles, 100,000,000; cod, 500,000; plaice, 35,500,000; mackerel, 25,000,000. So great is the demand for white fish throughout the kingdom, that many fishermen run as far north as the Orkneys to obtain them; and welled vessels in 1861 tried the experiment of carrying live cod all the way from Rockall, a very distant fishery (situated in lat. 57° 35′ N., and long. 13° 40′ W.), where there is an abundant supply of large fish, such as cod, but hitherto with little success. One vessel took on board forty score of live cod at this dêpôt, but on arriving at Great Grimsby only three score of these were found to be alive, for which a sum of £24 was obtained. Most of the cod-smacks carry their cargo alive as far as Gravesend; but they dare not venture further up the Thames, as the fish would not live in its foul waters. The Irish seas are famed for the fine quality of their white fish; the haddocks of Dublin, in particular, have a great reputation. In Scotland, a vast proportion of the haddocks are slightly smoked, and sold as 'Finnans,' which form a well-known breakfast delicacy in all parts of the country. Large quantities of cod and ling are caught, split up, and sold in a dried state.

The most valuable white fish, individually considered, is the aldermanic turbot, which brings a high price. Eels are also caught in large quantities at all seasons, and fetch a remunerative price in the London fish-markets. With reference to cod and ling, the annual returns published by the Board of Fisheries in Scotland shew that, in the year 1860, 115,688 cwt. were cured dried, and 4339½ barrels cured in pickle; and that the total quantity exported was 32,221 cwt. cured dried.

As regards crustaceans and shell-fish, Mr Mayhew, in one of his elaborate works on London, states their annual consumption as follows: Oysters, 495,896,000; lobsters (averaging 1 lb. each), 1,200,000; crabs (averaging 1 lb. each), 600,000; shrimps (324 to a pint), 498,428,648; whelks (227 to half-bushel), 4,943,200; mussels (1000 to half-bushel), 50,400,000; cockles (2000 to half-bushel), 67,392,000; periwinkles (4000 to half-bushel), 304,000,000. These numbers are applicable to a bygone time, and would require to be considerably augmented to represent the present consumption of these delicacies in London. This branch of the trade represents, according to some economists, an annual sum of about £300,000. The lobster, being by far the most valuable of the crustacean kind, is most assiduously nursed in ponds, so as always to be ready for market. Mr Scovell of Hamble, near Southampton, keeps a thousand or two always on hand, and steam-vessels are employed to bring them alive from the most distant parts of the coast: these boats are built exclusively for this purpose, and have immense wells in them to hold the living freight. The lobsters are not at once brought to London, but are kept ready in perforated boxes, on the Essex side of the Thames, to answer the demand as it arises. Norway supplies at least two-thirds of our lobsters. Mr Saunders, the extensive lobster salesman of Lower Thames Street, used to estimate the daily consumption of lobsters in Great Britain at 40,000. There is also an enormous demand for oysters, and a considerable proportion of our maritime population earn a comfortable livelihood by breeding and dredging them. At Whitstable, in Kent, and at various places in Essex, there are dêpôts for breeding and storing oysters. The 'spat' is procured and grown in the course of four years into a marketable commodity of much value. The Whitstable Oyster Company received for oysters, in 1859, the sum of £62,000; £50,000 of this sum being for native, and £12,000 for other kinds of oysters. The oyster is found in great abundance on the British coasts, there being famous fisheries for it both in Scotland and Ireland. In America, and other countries also, it is a common mollusc. See OYSTER.

Whilst sea-fisheries are open to all who have the means of working them, salmon-rivers are for the most part private property. The owners of particular streams usually form themselves into an association chiefly for the protection of the fish during the spawning season. The usual method is for the 'lairds' to let their fishings to tenants, who are called 'tacksmen,' and whose interest it is to capture and sell all the fish they can find. The rents obtained are, in some instances, very large, and form a handsome addition to the land-revenues of the proprietors. Before the invention of packing in ice, and previous to the introduction of steam-boats and railways, salmon used to be sold in the markets at the price of two-pence per pound. When the increased demand for it, created by these facilities of conveyance, caused it to attain its present price, tacksmen were tempted to overfish their streams, and the consequence has been the exhaustion of particular rivers. An elaborate report on the state of the English salmon-fisheries, presented to parliament in 1861, contains ample proofs of the universal falling off in the rivers of England and Wales. It is intended, however, under the auspices of the commissioners of the English salmon-fisheries, to take active steps to have them re-peopled with fish. The Scotch and Irish salmon-fisheries have also suffered from the effects of overfishing, and various legislative measures and other means have of late years been tried with a view to avert the extermination of this valuable fish. See SALMON, PISCICULTURE.

The following statement of the number of boxes of salmon received in London for the ten years ending in 1860, will afford an index to the value of the British salmon-fisheries. Each box contained

112 lb. The English rivers are included in the Welsh:

	Scotch.	Irish.	Dutch.	Norwegian.	Welsh.
1850	13,940	2,135	105	54	72
1851	11,593	4,141	203	212	40
1852	13,044	3,602	176	306	20
1853	19,485	5,052	401	1208	20
1854	23,194	6,333	345	None.	128
1855	18,197	4,101	227	None.	59
1856	15,438	6,568	68	5	200
1857	18,654	4,904	622	None.	220
1858	21,564	6,429	973	19	499
1859	15,630	4,855	922	None.	260
1860	15,870	3,803	849	40	438
Total	186,609	51,923	4891	1844	1956

It is impossible, from the paucity of reliable information, to do more than roughly estimate the amount of capital employed in the British fisheries, or the value of the stock of boats, nets, and other instruments of capture. However, it is certain that the annual value of the produce of British fisheries of all kinds is not less than £5,000,000.

The food-fisheries of France are now becoming co-extensive with those of Britain, so far as the capture of sea-fish and crustaceans are concerned; and in the cultivation of those less important fishes which thrive best in lakes, canals, and rivers, they excel us, for while we only cultivate these for purposes of amusement (see ANGLING), the French people make them an article of commerce, and derive large sums of money from their sale. At one time, the whole fresh-water fisheries belonging to France were not of so much value as one of our salmon streams; but by means of artificial cultivation and careful nursing, they have been much increased in value, and, by the care of the government, are being yearly extended. The fresh-water fisheries of France are of great extent, some of the fishponds in that country extending to upwards of thirty thousand acres. According to an official summary of the value of the fresh-water fisheries of France, dated 1860, the state exercises the right of fishing over 8135 miles of canals and water-courses; and individual proprietors exercise similar rights over 930 miles of canals and rivers, 114,889 miles of small water-courses, and 493,750 acres of lakes and ponds. In Paris, the annual consumption of fish gives for each individual a mean estimate of 27 lb. of sea-fish, and $\frac{7}{8}$ lb. of fresh-water fish.

Among the other foreign fisheries most worthy of notice are the river-fisheries of Germany, where the culture of the Danube salmon and other fresh-water fish is assiduously carried on. In the Mediterranean, various kinds of fish are taken, the one of greatest value being the tunny. The anchovy and sardine are also taken in large quantities. An account of the great eel-fishery at the mouth of the Po, on the Adriatic, has already been given in this work. See COMACCHIO. The Dutch are as industrious upon the sea as they were at the time when they founded Amsterdam, and a large proportion of the population of Holland are engaged in their fisheries, which are still a source of wealth to that kingdom, particularly the herring-fishery, which engages about twenty thousand people. The Norwegian fisheries afford large quantities of lobsters and turbots, while from Newfoundland is derived a plentiful supply of cod or ling. The Newfoundland fisheries, which are principally for cod, have existed for upwards of three centuries. Sir Francis Drake was the first person who fished there on behalf of England, and the fish he sent home soon excited a spirit of enterprise in the country, which led to the dispatch of a large number of ships and the extension of the fishery. The island is surrounded by the cod-banks, and the capture and cure of this fish form the staple occupation of the people. See NEWFOUNDLAND.

The oil-fisheries are not now so important as they were at one time, the invention of gas and the discovery of other lubricants having rendered us independent of whale oil. The success of the whale-fisheries has also fluctuated so much as to prevent modern capitalists from embarking very largely in the trade. The only novelties that distinguish the whale-fishery of the present day are the introduction of steam-whalers, and, in some instances, of vessels wintering in Greenland; but, with all these advantages, our whalers barely pay their expenses, and the fishery, as compared with former years, exhibits a considerable falling-off. In the year 1814, the total catch of the British ships engaged in the fishery, 143 in number, was 20,000 tuns, and in the following year, the Hull ships alone had 7987 tuns, exclusive of black oil. The series of years from 1813 to 1830 were remarkably prosperous, there being scarcely a broken season in the whole of that period. Formerly, London sent out a whaling fleet of twenty ships, and the Hull squadron in 1807 amounted to sixty-three vessels. The total whaling fleet numbered at one time 159 ships, but to-day it barely amounts to a tenth of that number. The seal is now largely captured for the purpose of obtaining its oil. See WHALE, CACHOLOT, SEAL, GREENLAND, &c. The South-Sea or sperm-whale fishery is principally in the hands of the Americans, who pursue this branch of commerce most successfully. The quantity of sperm-oil yielded by the fishing of 1861 was 68,932 barrels, or nearly 7000 tuns.

FISHERIES, LAWS REGARDING. As it is quite impossible, within the limits of the present work, to give any detailed account of the provisions which the legislature have introduced for the purpose of promoting and protecting our fisheries, we shall content ourselves with pointing out the principal objects which our policy has had in view with reference to this very important subject.

1. From a very early time, statutes have been passed both in England and Scotland, for the purpose of protecting the breeding of fish, and preventing the destruction of the spawn or fry. Of these the first in the statute book is 13 Edw. I. s. 1. c. 47, and the latest, 14 and 15 Vict. c. 26.

2. A feeling of the interest which the whole community has in the development of the fisheries, has led to a system of advancing public moneys for their encouragement; for this purpose, commissioners have been appointed, through whom money is advanced on loan. The last act having this object in view is 19 and 20 Vict. c. 17.

3. Bounties were formerly paid upon the taking and curing of fish of various descriptions, and on the vessels employed in various branches of the fisheries; but this method of encouraging the fisheries has been abandoned. The last statute relating to this subject is 7 Geo. IV. c. 34.

4. A treaty was entered into in 1839 between her Majesty and the late King of the French, and carried into effect by act of parliament (6 and 7 Vict. c. 79, amended by 18 and 19 Vict. c. 101), concerning the fisheries in the seas between the British Islands and France. By this convention, the limits within which the general right of fishing is exclusively reserved to the subjects of the two kingdoms respectively, are fixed at three miles' distance from low-water mark. With respect to bays, the mouths of which do not exceed ten miles in width, the three-mile distance is measured

from a straight line drawn from headland to headland.

5. In 1854, a similar treaty was concluded between her Majesty and the United States of America, relating, *inter alia*, to the rights of fishery between the British colonies in North America and the United States. This treaty was carried into effect by 18 and 19 Vict. c. 3.

6. The trade in fish, as regards the cities of London and Westminster, is regulated by acts of parliament, the chief objects of which are to secure a supply of fresh fish, and to prevent forestalling of the same. The first of these acts is 22 Geo. II. c. 49, and the last 4 and 5 Will. IV. c. 20.

7. Fresh fish of British taking, imported in British bottoms, may be landed without report or entry, under 16 and 17 Vict. c. 107, s. 49.

8. Persons employed in the fisheries, in such manner and under such circumstances as are laid down in 50 Geo. III. c. 108, are exempted from impressment.

9. The fisheries of Ireland are regulated by recent acts, of which the earliest is 6 and 7 Vict. c. 108, and the latest 13 and 14 Vict. c. 88.

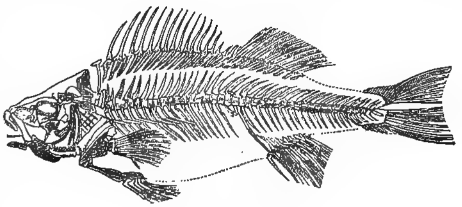
10. By the Scotch Act 21 and 22 Vict. c. 69, fees are imposed on the branding of barrels under the acts concerning the herring-fisheries. See Herrings, Salmon, &c.

FISHES, Royal—i. e., those which at common law are the property of the crown—are the whale and the sturgeon, when either thrown on shore, or caught near the coast. The ground of the privilege is said to have been the superior value of these fishes. They were considered too precious for a subject, just as the Swan (q. v.), which was a royal bird, was too good for any table but the king's. 'Our ancestors,' says Blackstone, 'seem to have entertained a very high notion of the importance of this right, it being the prerogative of the kings of Denmark and the dukes of Normandy; and from one of these it was probably derived to our princes. It is expressly claimed and allowed in the statute *De Prœrogativa Regis* (17 Edw. II. c. 11), and the most ancient treatises of law now extant make mention of it.'—Stephen's *Com.* ii. p. 547. Strictly, it was the head only of the whale which belonged to the king, the tail being a perquisite of the queen-consort (*Ib.* p. 457). In Scotland, whales thrown on shore above six horse-power draught, belong to the queen or her donatary, the admiral. Smaller whales have been claimed both by the landlord and the tenant on whose ground they are cast, but they are usually given to the catcher. In Shetland, where the washing of whales on shore is an occurrence of sufficient frequency to have given rise to a local custom, they are equally divided between the proprietor of the soil and those concerned in catching them. See Salmon.

FISHES (*Pisces*), the fourth—or, according to Milne-Edwards and some other naturalists (see Amphibia), the fifth—class of vertebrated animals; consisting of creatures which live in water, and accordingly breathe by gills (*branchiæ*), and not, at any stage of their existence, by lungs. In number—both of individuals and of different kinds—they are supposed to exceed all the other classes of vertebrate animals put together. Even the water of hot springs and the pools of caverns have their peculiar fishes, and some of these are only known as thrown out with torrents of muddy water by volcanoes.

The form of fishes is generally adapted to easy and rapid progression through water, being more or less nearly that of a spindle, swelling in the middle, and tapering towards the extremities; the outline unangular, and the surface smooth. But exceptions to this rule are numerous; and some, provided with other means of seeking their food, or of preservation from their enemies, exhibit the greatest possible departures from the ordinary shape: some are globe-shaped, some have a most irregular and angular outline, many are much elongated, as eels; and others are compressed and flattened, as flounders.

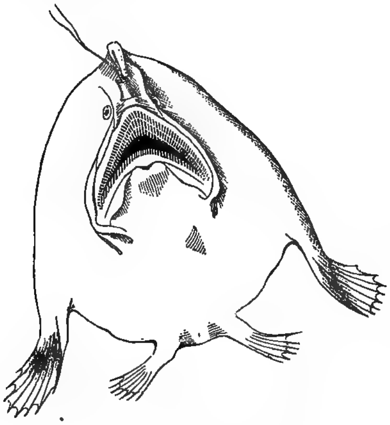
The bones of fishes differ much in their structure from those of other vertebrate animals: they are less dense and compact, and when their ossification is perfect, remain separate, as in the early embryotic state of the *Mammalia*. The bones of the sub-class of Cartilaginous Fishes (q. v.), however, never become properly ossified. The bones of fishes generally contain a smaller proportion of earthy matter than those of other vertebrate animals, and their cartilaginous basis contains no gelatine strictly so called. The typical character of the vertebrate skeleton is, however, maintained, although modified; and many of the bones—a great majority, for example, of those of the head—are evidently homologous with those of quadrupeds and of man. There is no neck, and the vertebræ are distinguishable only into abdominal and caudal. The vertebræ are concave at each end, and pierced in the middle, the hollow space being occupied with a gelatinous substance. Spinous processes, sometimes short, sometimes long, extend upwards and downwards from the vertebræ to support the muscles. Fishes also generally have ribs, connected with the abdominal vertebræ; and in many, an additional set of small bones (*epipleural spines*) connected with the ribs, and arising from near the base of the ribs, extends outwards and backwards through the lateral muscles. The four limbs which belong to the typical structure of vertebrate animals, assume in fishes the form of *Fins* (q. v.), and are generally, although not always, all present, the first pair being the *pectoral*, the second pair the *ventral* fins. In some fishes, the ventral fins, answering to the hind-feet of quadrupeds, are actually further forward than the pectoral fins, and are then called *jugular* fins. In some, as the common eel, the ventral fins are wanting; in some, as the *Muræna*, there are neither pectoral nor ventral fins. Connected with these fins are bones, which shew that they represent the limbs of other vertebrate animals. Fishes have, however, also other fins not so closely connected as these with the internal (*endo-*) skeleton, and not placed like them in pairs towards the sides, but vertically on the middle (*mesial*) line; one or more (*dorsal*) on the back; one or more (*anal*) on the opposite or ventral aspect, behind the anus; and one (*caudal*) at the extremity of the tail. The caudal fin is in general the principal organ of locomotion, and most of the muscles of the body combine to give great energy to its strokes, great part of the body moving with it, and the vertebræ with their processes being so framed as to admit great freedom of lateral, and scarcely any vertical motion. The pectoral and



Skeleton of Perch.

ventral fins seem to serve chiefly for balancing the body, and guiding and staying its motion; the dorsal and anal fins, like the keel of a ship, for keeping it in its proper position. All the vertical fins are supported by bones which do not join those of the internal skeleton, but are thickest at the skin, from which they penetrate towards the vertebræ, being interposed between the spinous processes of the vertebral column. Several of the last caudal vertebræ are generally very short and combined, and the interposed spines which support the caudal fin converge towards them. The *rays* of fins are either pointed bones (spines)—sometimes prolonged beyond the membrane, and forming defensive weapons—or they are cartilaginous and jointed, in which case they often also branch near their summit. The caudal fin never has any other than these soft rays, and many fishes have no other in any of their fins. A few fishes, belonging to different families, have the pectoral fins developed to an unusual degree, so as to make them capable of supporting short flights in the air (see FLYING FISH and FLYING GURNARD); and a few are capable of employing their fins as organs of locomotion in a very different way, creeping along the ground, or hopping among the weeds and stones of the shore.

The heart of fishes consists only of one auricle and one ventricle, receiving venous blood only, and sending it to the gills, where, being oxygenated, it passes into the greater or systemic circulation by the dorsal vessel. See CIRCULATION. In most fishes, there is, close to the heart, a thick *bulb* or muscular swelling of the great artery which conveys the blood from the heart to the gills, and which assists in propelling the blood, being furnished with valves to prevent its regurgitation into the heart; and this bulb and its valves exhibit varieties admirably characteristic of different natural groups, much founded upon in the system of Müller and Owen. The blood of fishes is red; its corpuscles are oval and of considerable size, but in general not very numerous. Fishes consume little oxygen in respiration, and are *cold-blooded* animals, having in general a temperature little elevated above that of the water in which they live; although there are some singular exceptions to this rule, as the tunny, sword-fish, &c., which, having a comparatively high temperature, have also redder blood with more numerous corpuscles. The oxygen appropriated by means of the gills in respiration is not obtained by decomposition of water, but from the air which is mixed in it, and hence the necessity of aërating an aquarium; hence also we perceive one of the benefits resulting from the agitation of the ocean and of lakes by winds. Some fishes require a greater supply of air than they can easily obtain from the water, and frequently come to the surface to breathe. Fishes taken out of the water die from want of breath, in consequence of the drying up of the fine fringes of the gills; and those which are capable of subsisting longer out of water than others, have generally small gill openings, not so freely admitting the air to dry the gills, whilst a few are provided with receptacles for water to keep them moist. See ANABASIDÆ.



Cheironectes Caudimaculatus.

The gills of fishes are situated at the back part of the sides of the head, and consist of a multitude of very vascular membranous plates, which are generally in double fringe-like rows fixed by the base only, and simple, although in a few fishes they are feathery, and in the greater number of *Cartilaginous Fishes* (q. v.), they are fixed both by their external and their internal edges, or consist of mere folds of membrane attached to the surface of the gill-cavities. In general, there are four gills on each side; the number is greater in some of the Cartilaginous Fishes. In Osseous Fishes, the gill-plates are attached to the external edge of the branchial arches, bony arches connected with the *hyoid bone* or bone of the tongue—which is unusually developed in fishes—and with the base of the skull, the connection at both ends being effected by intervening small bones, and the whole forming a complicated system; whilst the cavity containing the gills, on each side of the head, is covered by a bony plate, the gill-lid, gill-cover, or *operculum*, with two subordinate pieces, called the *sub-operculum* and *inter-operculum*, articulated on the temporal bone, and playing on the *pre-operculum*, a bony plate placed before them in the head. It is by the motion of these bony plates that the water is expelled which is taken in by the mouth, and which, after passing amongst the gills, and supplying them with air, passes out by the gill-orifices at the back of the head. Besides these opercular plates or bones, a series of flattened rays, connecting them with the bone of the tongue, and called the *branchiostegal rays*, aid in forming the gill cavities. In the branchiostegal rays, distinctive characters of fishes are often found.

The brain of fishes differs very considerably from that of other vertebrate animals. See BRAIN. In general, they possess the nerves and organs of all the senses, although the senses of touch and taste are commonly supposed to be more dull than in many other animals; and a few fishes, living chiefly in mud, or in the waters of caverns, are destitute of eyes, and consequently of sight, although even they possess optic nerves, and seem sensitive to light. But in most of them, the eyes are large, and vision is evidently very acute; and some have cirri or barbules near the mouth, filaments proceeding from some of the fin-rays, &c., which are regarded as delicate organs of touch, adapted to the wants and habits of the particular species. The eyes are covered by the skin, modified in its character, and have no eyelids nor nictitating membrane. They are very variously placed in different kinds. There is no external ear.

The mouth is the only organ of prehension. It is very different in different kinds—sometimes very small, sometimes extremely large, sometimes forming a sucker by which the fish can both fix itself and pump up the fluids of the animal on which it preys. The snout is also abbreviated, prolonged, or otherwise modified in very various ways. The teeth are far more various in form, number, position, and structure, than in any other class of animals. They never have any roots, but are fixed to the bones which support them; they fall off, however, and are replaced. Some fishes have no teeth; some have very small teeth; some have teeth in great number, but so fine as to resemble the hairs of a brush; some have short thick teeth; some have long sharp teeth, either straight or crooked; some have teeth so flat and closely set that they resemble a regular and beautiful pavement; and the teeth of fishes are sometimes situated not only on the jawbones, but on the *vomer* or bone extending along the middle of the roof of the mouth, and indeed, also, on other parts of the palate to the very throat, and very commonly on the tongue. The food of fishes is various: a few subsist on vegetable food of different kinds, but most of them on animal food, of which there is no kind that does not seem to be particularly agreeable to some of them, from the mere animalcule or the most minute crustacean to the flesh of the mammalia. In general, they are excessively voracious, and seem to spend most of their lives in seeking food. Many of them prey on other fishes, and many seem equally willing to devour other species or the younger and weaker of their own. Some of them swallow their food almost or absolutely alive; others subject it to processes of comminution, trituration, and mastication in the mouth. Salivary glands are not found in fishes, although they exist in some of the invertebrate animals. The digestive process seems to be performed very rapidly. The stomach and intestines vary very much in different kinds. The kidneys are in general extremely large, extending through the whole length of the abdomen.

The *air-bladder* is found in many fishes, but not in all; and is present or absent in different fishes even of the same genus or family. See AIR-BLADDER. Its uses, and its connection with the habits of particular species, have as yet been but partially ascertained.

Fishes are oviparous (egg-producing); a few are ovoviviparous (eggs hatched within the body, and young produced alive). The chief reproductive organs are generally two elongated lobes of a fatty substance, *milt*, in the males, and of rudimentary eggs, *roe*, in the females. Impregnation usually takes place after the *roe* or *spawn* is deposited, the male accompanying the female to the place of spawning. In some Cartilaginous Fishes, it takes place before the deposition of the eggs; and male sharks and rays are furnished with organs called *claspers*, the use of which is well indicated by the name. The fecundity of fishes is generally very great, and their eggs very small in proportion to the size which they ultimately attain, although this is not so much the case in the Cartilaginous Fishes already mentioned. Some of the fishes most valuable to man, as the salmon, herring, and cod, are remarkable for their fecundity. Nine millions of eggs have, according to Leuwenhoek, been ascertained to exist in the roe of a single cod; and provision is thus made both for the preservation of the species amidst all the dangers to which the spawn and the young are exposed, and for the wants of man. The spawn of fishes is deposited in very different situations, according to the different kinds—as by some on aquatic plants, by some on beds of sand or gravel; but many species leave the depths of the ocean in order to deposit it in shallower waters, and some, usually marine, ascend rivers for this purpose. Very few fishes take any care of their eggs or young; but there are remarkable exceptions to this rule, and some of the gobies and sticklebacks are known to tend their young with great care. Sticklebacks also construct nests. See STICKLEBACK. It is not long since this curious fact was discovered, although these little fishes have been so long familiarly known; and it is therefore not improbable that many other fishes may have the same habit.

The growth of fishes is very rapid when supplies of food are abundant, but becomes slow in less favourable circumstances, or is arrested for a long time, in a manner to which there seems to be nothing similar among other vertebrate animals.

The skin of fishes is generally covered with Scales (q. v.), which, however, are sometimes minute and imbedded in the skin, and sometimes altogether wanting. The scales are either horny or bony, and are generally imbricated, like the slates of a roof, their free ends backwards; but sometimes form bony plates, fixed by the whole of their lower surface. They usually exhibit beautiful symmetrical markings and inequalities of surface of various kinds, and in some are covered with a thick coat of enamel. The differences of character in the scales have been made the foundation of a classification of fishes by Agassiz, by whom all fishes are distributed into the four orders of *Cycloid*, *Ctenoid*, *Placoid*, and *Ganoid Fishes* (see these heads), having respectively cycloid, ctenoid, placoid, and ganoid scales; a classification which has been found particularly convenient with reference to fossil fishes, although other systems maintain their ground against it as preferable for recent species. It is not, however, wholly artificial, for a relation can be very generally traced between the character of the scales and the general structure and economy of a fish.

The scales of a row extending from the head to or towards the tail on each side of the body of Osseous fishes in a somewhat waved line, called the *lateral line*, are pierced for the transmission of a slimy matter, with which the whole body is lubricated.

The colours of fishes depend upon a substance consisting of small polished laminæ, secreted by the skin.

As fishes need no covering, like fur or feathers, to prevent the dissipation of their animal heat in the surrounding medium, their scales must be regarded chiefly as defensive armour. Some of them are also defended by large bony plates, which are either on the head alone or also on the body, and some by spines connected with the fins, gill-covers, &c. Few have any other offensive weapons than their teeth, but the spine attached to the tail of some rays is a remarkable exception, as is also the elongated snout or beak of the sword-fish, saw-fish, and a few others. But a much more remarkable kind of armour—probably both offensive and defensive—is possessed by a few fishes, in an electrical apparatus, by which they can give severe shocks. It is also an interesting fact, that the electrical apparatus is quite different in different fishes possessing it, the Gymnotus or Electric Eel, the Torpedo, and the Electric Silurus or Malapterurus. See ELECTRICITY, ANIMAL.

Many fishes are gregarious, swimming in shoals, which in some species consist of immense multitudes. Some also make periodic migrations; salmon, for example, ascending our rivers, and herrings and pilchards visiting our coasts, but the long migration formerly ascribed to these fishes is now doubted or disbelieved. The occasional overland migrations of eels, and the more frequent overland migrations of some tropical fishes, cannot but be regarded with peculiar interest; and the instinct is very wonderful by which, when fleeing from a pool that is about to be dried up, they direct their course towards a place where water is more abundant. This faculty is, however, rare, although possessed by tropical fishes both of the eastern and western hemispheres; but more generally the fishes destined to inhabit tropical ponds which are liable to be dried up, are capable of living dormant, imbedded in the mud, till they are liberated again by the rains, when they reappear in their former multitudes.

Of the uses of fishes to man, by far the most important is that of supplying him with food. Fishes form an article of food in almost all countries, and in some a principal part of the food of the inhabitants. Many fishes are highly esteemed for the table, which are not procured in sufficient abundance to be a principal part of food in any country. Some fishes, on the contrary, are unpalatable; and some, mostly tropical, are poisonous, whilst others are poisonous only at particular seasons.—The skin of some Cartilaginous Fishes yields SHAGREEN (q. v.), and the air-bladder of some fishes yields ISINGLASS (q. v.). The minute laminæ which give brilliancy of colour to some, and the similar substance found in the air-bladder of others, afford the materials of which artificial pearls are made. —Oil useful for lamps is obtained from a number of fishes, and the medicinal value of cod-liver oil is now well known.

The classification of fishes most generally adopted is that of Cuvier, who divides them into OSSEOUS FISHES (having true bones), and CARTILAGINOUS FISHES (q. v.); and divides Osseous Fishes into Acanthopterous Fishes (*Acanthopterygii*, q. v.), and Malacopterous Fishes (*Malacopterygii*, q. v.). The system of Agassiz has already been noticed. That of Müller and Owen differs from both.

Fossil Fishes.—The medium in which fishes live, and the hard and almost indestructible nature of some portions of their skeletons—as their teeth, spines, and scales—would lead us to anticipate their frequent occurrence in the Sedimentary rocks; but inasmuch as the soft parts of the animal are liable to speedy decomposition, the remains of fish must often exist in a fragmentary and scattered condition. Thus, the teeth in the shark, the spine defence in the sting ray, and the scales in the bony pike, would survive the total destruction of the cartilaginous skeleton as well as the soft portions of these fish, and would alone remain to testify to their existence.

The earliest ichthyc remains are of this fragmentary character. They have been obtained from the 'Ludlow rock,' a member of the Upper Silurian series, and consist of spines and portions of skin, that have been thickly covered with hard tubercles and prickles, like the shagreen of the shark's skin. The spines most nearly resemble the dorsal spine of the dogfish; they are small, flattened, and slightly curved. Along with other similar fragmentary remains, they have been placed under the somewhat indefinite generic title *Onchus*.

The minute, compressed, conical, and glistening bodies, called *Conodonts*, obtained in great numbers from the Lower Silurian measures in Russia, and considered by their describer, Pander, to have been the teeth of fishes, belong certainly to very different animals. Their small size and peculiar forms, and the entire margin of the hollow base by which they were attached, shew them to have been the denticles from the lingual ribbon of shell-less molluscs, which have left no other traces of their existence than these remarkable Conodonts.

The Ludlow bone-bed contains the earliest noticed fish remains. No idea of the numerical importance of fishes at this early period can be satisfactorily formed; yet these remains being confined to a single thin bed, and occurring rarely even in that, would seem to indicate that the Silurian seas were but thinly tenanted by these earliest sharks.

In the immediately succeeding Devonian rocks, their numbers largely increased. The ichthyodorulites, or fossil spines of this period, have been referred to fourteen different genera. Numerous species of true ganoids have been determined from their well-preserved enamel scales, which occur singly or in confused groups, and frequently also associated with the head, fins, and tail, so as to present a faithful 'nature-print' of the fish upon the rock. See DIPTERUS, DIPLACANTHUS, &c. But the most remarkable and characteristic fossils of this period are the Buckler-fishes, whose head and part of their body were covered with bony plates, giving them so singular and anomalous an appearance, that some of them were originally considered crustacean. They are almost confined to the Old Red Sandstone series, a single species (found in Permian strata) being the only cephalaspid that is known later. See CEPHALASPIS, COCCOSTEUS, PTERICHTHYS, &c.

Fish remains are of frequent occurrence in the Coal-measures. Upwards of twenty species of plagiostomous fishes have been determined from the spine defences, some of which are very large and powerful. The frequency with which the peculiar teeth of the cestracionts are met, shew that they must have been common in the carboniferous seas. Ganoids were also abundant. See PALÆONISCUS, HOLOPTYCHIUS, &c.

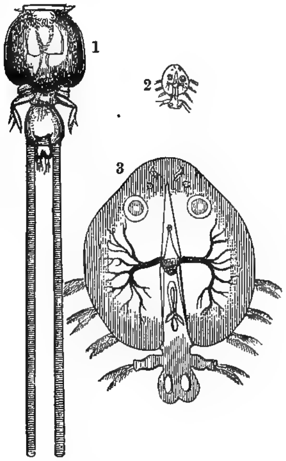
In the Permian period, the forms are similar to what exist in the older strata. Up to the last Permian deposit, the fish have all possessed heterocercal tails; but with the Secondary rocks, the homocercal tail not only appears, but becomes the more frequent form.

Numerous species and many new forms appear in the Trias and Oolite. Sharks are remarkably abundant in the Cretaceous strata; but the Chalk is specially remarkable from containing the earliest discovered remains of the true bone-fishes—those covered with ctenoid and cycloid scales.

In the Tertiary strata, the character and proportion of ichthyc remains exhibit a condition in the inhabitants of the water very similar to what at present prevails. The cartilaginous orders decrease, and are replaced by osseous fishes, such as the salmon, cod, turbot, and herring—fishes which are of much greater value to man than those they superseded.

FISH-HOOKS. A considerable amount of skill is required for the successful manufacture of these simple articles. There are two kinds in the market, the English and the Limerick fish-hooks; the latter are in the highest repute among anglers. The English fish-hooks are made chiefly at Redditch, in Worcestershire. Steel-wire is cut into the required lengths, and softened; then the ends of three of these are inserted into shallow holes of a sort of rest or standard, and thus supported, the barbs of all three together are cut up by the skilful pressure of a stout knife; they are then pointed, and turned by pressing them against a little ridge of sheet-brass let into a block of wood, and having the requisite curvature. The other end is next flattened out, by laying it on a small anvil, and striking a blow with a hammer. This is done to prevent the silk ligature from slipping over the end. The finer worm-hooks have the shanks filed, in order that the silk dressing may not enlarge the shank so much as to prevent the slipping of the worm over it. They are then hardened, tempered, and blued. The Limerick hooks are made by cutting the steel, which is made from the best malleable iron, into lengths for two hooks. The ends are then forged out to the shape of barb and point, and the barb is undercut *with a file* from the solid forged end, instead of being cut and turned up with a knife. This constitutes the chief superiority of the Limerick hooks. They are shaped to the required curve by grasping them in circular pliers, and bending the wire with a turn of the wrist.

FISH-LOUSE, or **SEA-LOUSE**, names commonly given to the entomostracous crustaceans of the order *Siphonostoma.* All the creatures of this order are of small size, and parasitic on fishes, aquatic batrachians, &c., on the juices of which they live, although they have also the power of swimming freely in the water, some of their legs being adapted to this purpose, and, indeed, they can swim with extreme rapidity, making use of this power to gain that place where they may obtain food at the expense of other creatures. They do not begin life as parasites, the females depositing their numerous eggs on stones, plants, &c. They are animals of singular form and appearance. The genera *Argulus* and *Caligus* are now regarded as the types of two families. In the former, there is a curious sucking disc on each side of the beak or proboscis, although there are also jointed members terminated by prehensile hooks. In the latter, the hooks of the anterior pairs of feet are the principal organs of adhesion to the slippery bodies of the fishes from which food is to be drawn; and the abdomen of the female is furnished with two remarkably long tubes, the functions of which are not perfectly ascertained. The bodies of all of them are transparent, or nearly so. Some of the *Caligidæ* are common on many of the British sea-fishes; *Argulus foliaceus* on fresh-water fishes, and even on tadpoles. Sickly fishes often become the victims of multitudes of these creatures.



Fish-Louse:
1, *Caligus* (female); 2, *Argulus*, natural size; 3, *Argulus*, magnified.

The name fish-louse is sometimes given also to the *Lernæidæ*, but they are very different.

FISHING-FROG. See Angler.

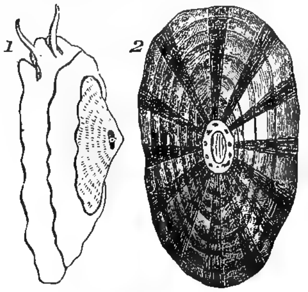
FISHING-TACKLE. See Angling.

FISHPONDS. See Pisciculture.

FISK, or **FISC**, a term often to be found in Scottish law-books. It is derived from the Latin *fiscus*, literally, a wicker-basket, which came ultimately to signify the privy purse of the emperor, as distinguished from the public treasury, which was called *ærarium.* In Scotland, it signifies generally the crown's revenues, to which the movable estate of a person denounced rebel was formerly forfeited. It still gives his name to a very important officer, the Procurator Fiscal (q. v.), or public prosecutor in the first instance, by whom all crimes are prosecuted before sheriffs and other inferior judges, and whose duty it is to report to crown counsel—i. e., to the Lord Advocate, or his deputes—all cases which, from their aggravated character, require to be tried by a higher court. See Public Prosecutor.

FISSIRO'STRES (Lat. split-beaked), a tribe of birds, one of the tribes into which the great order *Insessores* is divided. It is characterised by peculiar width of gape, and the bill is depressed or horizontally flattened, short, and often furnished with strong bristles at the angles; the birds of this tribe being insectivorous, and generally subsisting by catching insects on the wing, to which this structure of bill is beautifully adapted. The powers of flight are generally great, but the legs are short and weak. Swallows and goat-suckers are familiar examples of this order.

FISSURE'LLIDÆ, a family of gasteropodous molluscs, of the order *Scutibranchiata.* The shell much resembles that of the limpet family (*Patellidæ*), but has either a hole at the apex, or a slit at the front margin. The hole at the apex characterises the genus *Fissurella* (Keyhole Limpets), and the slit appears in the genus *Emarginula.* These openings of the shell are subservient both to the passage of the water requisite for respiration, and the discharge of the excrements. The fissurellidæ resemble limpets in their habits, and are found either on the sea-shore or at no very great depth. They are widely distributed over the world. Several species are British.



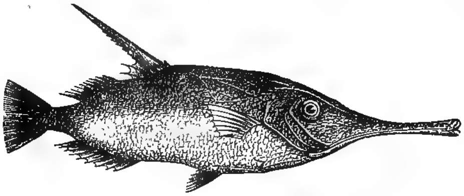
Fissurella:
1, the animal; 2, the shell.

FI'STULA, in former times, was applied, in its etymological meaning of a *pipe*, to such Abscesses (q. v.) as had contracted to narrow, hard, open passages in the soft texture of the body (see Tissue), lined by a kind of false membrane, giving rise to a thin discharge. At the present time, however, the term fistula is generally limited to the opening of such a passage when in close contact with a mucous membrane. Thus it is common to speak of salivary, urinary fistula, &c.; and the most common and troublesome kind of all is the fistula in ano, in connection with the lower bowel, or Rectum (q. v.). The treatment of fistula should only be intrusted to experienced surgeons; but there are always quacks in abundance willing to undertake it, and hold out flattering hopes of an early cure without proper surgical procedure.

For the cure of salivary or urinary fistula, all that is generally necessary is to restore the patency of the ducts, which is done by passing instruments along them. Should a fistula, however, be situated where it is surrounded by muscular fibres, as at the orifice of the lower bowel, it is necessary to divide these muscular fibres, so as to leave the part at rest while nature repairs it. As the sinus, which is the continuation inwards of the fistula, is lined with imperfectly organised lymph, it is generally necessary to stimulate the part by the introduction of lint, either alone or saturated with some irritant, such as the sulphate of zinc, which, when mixed in the proportion of 1—3 grains to each ounce of water, and coloured with lavender, makes the famous red lotion of the shops.

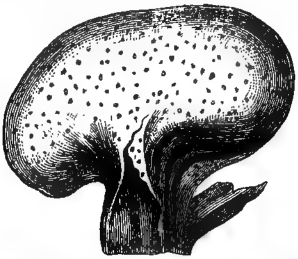
At times, however, fistulæ require more elaborate treatment, and are extremely difficult to close, especially those which result from loss of tissue between two adjacent mucous canals; fortunately, however, modern surgery is able to remedy these also. It is necessary to make the edges of the orifice once more raw, and to bring them in contact, but formerly the wound used rarely to unite, as the stitches produced such an amount of irritation. Now, however, by the use of silver or iron wire, according to the taste of the surgeon, the parts can be kept together long enough to insure union; and thus, by the ingenuity of American surgeons, especially Marion Sims of New York, and others in this country, certain diseases of women, arising from protracted labours, and formerly rendering the unfortunate subjects of them miserable and unfitted for any of the duties of life, may be now remedied by a skilfully performed, but almost painless proceeding.

FISTULA'RIDÆ, AULOSTO'MIDÆ, or **FLUTEMOUTHS,** a family of acanthopterous fishes, remarkable for the conformation of the head; the skull being elongated into a tube, at the extremity of which are the mouth and jaws. The species are all marine; they are widely distributed; only one, the Snipe-fish, Sea-snipe, or Trumpet-fish (*Centriscus scolopax*), is found, and that very rarely, in the British seas. These fishes are not to be confounded with the Pipe-fishes, which have a similar elongation of snout, but are otherwise very different.



Snipe or Trumpet Fish (*Centriscus scolopax*).

FISTULI'NA, a genus of fungi allied to *Boletus* (q. v.); the under surface (*hymenium*) at first covered with minute warts, which ultimately form tubes. *F. hepatica* is common in Britain and throughout Europe on old oak, walnut, and chestnut trees; it occurs also on ash and beech. It is semicircular, of very regular outline, with a lateral stem, or none; its colour red; its substance fibrous and fleshy, much resembling beet-root. When old and beginning to decay, it looks like a mass of liver. It sometimes attains a great size. Dr Badham describes a specimen nearly five feet round, and weighing eight pounds. Mr Berkeley mentions one which grew on an ash pollard, and weighed nearly thirty pounds. This fungus is much esteemed in some parts of Europe as an esculent; it is wholesome and nutritious; and the abundance in which it may often be procured, makes it the more worthy of regard; whilst there is almost no possibility of confounding it with any dangerous fungus. Its taste resembles that of the common mushroom, but is rather more acid. 'When grilled, it is scarcely to be distinguished from broiled meat.' It furnishes itself with abundance of sauce.



Fistulina Hepatica.

FITCHET. See POLECAT.

FITCHY, or **FITCHÉ.** Crosses are said, in Heraldry, to be fitchy when the lower branch ends in a sharp point. Crosses are supposed to have been so sharpened to enable the primitive Christians to stick them into the ground for devotional purposes.

FITS, a name popularly applied to Convulsions (q. v.), or, indeed, to any sudden seizure of disease implying loss of consciousness, or any considerable change in the condition of the mind.

FITZ is an old Norman word signifying 'son,' evidently from the Lat. *filius* (Fr. *fils*). Like the Scotch *Mac*, the Irish *O'*, and the Oriental *Ben*, it is prefixed to proper names to signify descent, as in the Norman names Fitzwilliam, Fitzwalter, Fitzgerald. A later application of it has been to denote the natural sons of royalty, as in Fitzroy, Fitzjames, and Fitzclarence. The Russian termination *witch* is a disguised form of the same word.

FIU'ME (in the Illyrian language, *Reka* or *Rika;* Latin, *Fanum St Viti ad flumen*), an important seaport of Austria, is situated at the efflux of the Fiumara into the Gulf of Quarnero, in the Adriatic, 40 miles south-east of Trieste, across the Istrian peninsula, in lat. 45° 20′ N., and long. 14° 26′ E. F. has quite the character of a German town, is adorned with many handsome buildings, and consists of an old and new town, which together contain about 14,000 inhabitants. It has manufactures of tobacco, rosoglio, wax, paper, chemicals, and a flourishing trade in ship-building. F. has a fine freestone quay, with a light-house, but has little commerce. It has been a free port since 1722; and in 1849 was severed from Hungary with the territory to which it belongs, and now forms a portion of the Austrian crownland of Croatia.

FIVES, a popular game in England, and one especially enjoyed by school-boys, and in certain barracks where there is a 'court,' by soldiers. The game existed at a very early period—14th c.—both in France and England, being termed 'palm-play' in the former, and 'hand-tennis' in the latter; its present name is derived from its being played usually by five on each side. The method of playing the game is very simple: a good roomy court is requisite, bounded by a high wall at one end, and against this wall a ball is propelled by striking it with the open hand. The players arrange themselves either five against five, as is usually the case, or in fewer numbers, and begin the game by one member striking the ball against the wall, and causing it to rebound anywhere beyond the floor-score, which is about two yards from the wall; one of the opposite party then strikes the ball as it rebounds, and if it does not touch the wall higher than three feet from the ground, his stroke goes for nothing, and the opposite party score one. The ball may be struck either from a direct rebound before it reaches the ground, or after it has 'dapped' or hopped from the ground once. Fifteen is usually game. When the players are skilful, the ball is kept going by the alternate strikers for many minutes at a time, and the game is thus rendered exciting both for players and onlookers.

FIXED AIR was the name given to Carbonic Acid (q. v.) by Dr Black, who was the first to observe that the solid substance, carbonate of magnesia (MgO,CO_2), could, when heated, evolve carbonic acid (CO_2), proving that the latter was a *fixed air* whilst in union with the magnesia.

FIXED BODIES is a term applied in chemistry to those substances which remain fixed, and are not volatilised at moderately high temperatures.

FIXED OILS are those oils which, on the application of heat, do not volatilise without decomposition. See OILS.

FIXED STARS. See STARS.

FIXING, in Photography. When a picture has been obtained through the agency of light, by the exposure of a sensitive surface suitably prepared, and the subsequent development of the latent image, there remains in the deepest shadows of the picture a portion of the sensitive material, unacted upon by light. The removal of this unaltered sensitive material by an appropriate solvent, is termed fixing, though the term *clearing* would perhaps be preferable, fixing being more strictly accurate in the case of the Daguerreotype process (q. v.), where the picture is literally *fixed* to the silver-plate by the deposition of a film of metallic gold, of extreme tenuity, from a boiling hot solution of Sel D'or (q. v.).

For particulars of failures arising from imperfect fixation or clearing, see PRINTING PROCESS.

FI'XTURES, in the Law of England, are those personal chattels (q. v.) which are let into the soil, or otherwise actually affixed to the freehold; a definition which is sufficiently accurate to afford a principle for the solution of the questions which arise between landlord and tenant as to the right of the former to retain, or of the latter to remove—but a principle, the application of which is attended with many practical difficulties. If the chattels be entirely clear of the soil, they are not fixtures at all, and may be carried off at pleasure like any other species of personal property. The general rule as to what constitutes a fixture legally immovable is, that it must be either let into the earth, or cemented or otherwise united to some erection previously attached to the ground, so that it would be waste to remove it afterwards (Woodfall, pp. 466, 467). But it must be remarked, that a tenant may in all cases construct any erection he may make in such a manner as that it shall not become a fixture. Thus, if he even erect buildings—as barns, granaries, sheds, and mills—upon blocks, rollers, pattens, pillars, or plates, resting on brickwork, they may be removed, although they have sunk into the ground by their own weight (*Ib.* 467). To this rule various exceptions have been made in favour of what have been called *trade-fixtures*, or fixtures put up for the purpose of carrying on a trade; and the statute mentioned below has greatly modified the law as to those erected for agricultural purposes. It is difficult to state the limits of the exception with reference to trade-fixtures with any approach to accuracy. The following is perhaps as near an approach as the varying circumstances of each individual case will admit of. 'Whenever the following circumstances occur, it may be confidently pronounced that there the tenant may safely remove the article. Thus, things which the tenant has fixed to the freehold for the purposes of trade or manufacture, may be taken away by him whenever the removal is not contrary to any prevailing practice; where the articles can be removed without causing material injury to the estate, and where of themselves they were of a perfect chattel nature before they were put up, or at least have in substance that character independently of their union with the soil—or, in other words, where they may be removed without being entirely demolished, or losing their essential character or value' (*Ib.* p. 468); see also the case of Hellawell *v.* Eastwood, 6 Excheq. Rep. 312. Nurserymen have been allowed to remove trees and shrubs which they have planted expressly for purposes of sale, but not to plough up strawberry-beds, out of the ordinary course of management of the nursery-ground. Neither can they remove hot-houses, green-houses, forcing-pits, or other erections of that description; and in no case can private persons sell or remove fruit-trees, though planted by themselves (Amos and Ferand on *Fixtures*, 343, 2d edition). The provision of the common law of England with reference to agricultural fixtures has been modified by 14 and 15 Vict. c. 25, s. 3, which provides, that if any tenant of a farm or land shall, with the consent in writing of the landlord for the time being, at his own cost, erect any farm-buildings, either detached or otherwise, or put up any other building, engine, or machinery, either for agricultural purposes or for the purposes of trade and agriculture (which shall not have been put up in pursuance of some obligation in that behalf), then all such building, engines, and machinery shall be the property of the tenant, and shall be removable by him, notwithstanding the same may consist of separate buildings, or that the same, or any part thereof, may be built in or permanently fixed to the soil, so as the tenant making such removal do not in anywise injure the land or buildings belonging to the landlord, or otherwise do put the same in like plight and condition as the same were in before the erection of anything so removed, provided that no tenant shall be entitled to remove any such matter or thing without giving to the landlord or his agent one month's previous notice in writing of his intention so to do; and thereupon it shall be lawful for the landlord, or his agent, on his authority, to elect to purchase the matters and things proposed to be removed; and the right to remove the same shall thereby cease, and the same shall belong to the landlord; and the value thereof shall be ascertained by two referees, one to be chosen by each party, or by an umpire to be named by such referees, and shall be paid or allowed in account by the landlord who shall have so elected to purchase.' This act is confined to England; but in questions of fixtures, as Mr Hunter observes, the common law of England having been deemed practically authoritative in Scotland, the clause affords valuable matter for consideration, as shewing what has been held advisable in England (*Landlord and Tenant*, p. 290, 3d edition). In Scotland, it has been customary, in agricultural leases more particularly, to determine the respective rights of landlord and tenant by positive stipulation, and, for this reason, fewer points have been decided by the courts than in England.

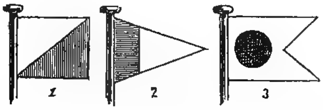
As regards urban tenements, the rule seems to be, that the tenant may remove whatever he has fixed up for ornament or domestic use—e, g., hangings, wainscot, stoves, &c., but not such erections as have become part of the tenement, and constitute permanent improvements. Thus, he cannot remove a conservatory fixed to and communicating with rooms in a dwelling-house by windows and doors.

FLA'CCUS, C. VALERIUS, a Roman poet, who flourished in the 1st c., and is supposed to have died 88 A.D. Absolutely nothing is known regarding his life. He is the author of an epic poem on the Argonautic expedition, which in its extant form is incomplete. Some modern critics, Wagner among others, praise it extravagantly, and place the author next to Virgil; but the more general opinion of sound scholars is, that the work is rather a specimen of learned mediocrity than of genuine inspiration. The *editio princeps* of the *Argonautica* appeared in 1472. Of modern editions, may be mentioned those of Wagner (Gött. 1805) and Lemaire (Paris, 1824). An English metrical translation was published by one Nicholas Whyte as early as 1565. Similar translations exist in French, Italian, and German.

FLACOURTIA'CEÆ, a natural order of exogenous plants, allied to Passion-flowers, consisting of shrubs and small trees, almost exclusively confined to the warmest parts of the globe. Many of the species, particularly of the genus *Flacourtia*, produce pleasant, sweet, or subacid fruits. *Flacourtia inermis* is much esteemed and cultivated in the Moluccas. Arnotto (q. v.) is produced by a tree of this order.

FLAG, a popular name for many endogenous plants with sword-shaped leaves, mostly growing in moist situations. It is sometimes particularly appropriated to the species of *Iris* (q. v.), or Flower-de-luce; but is given also very indiscriminately to other plants of similar foliage, as the *Acorus calamus* (see ACORUS), which is called Sweet Flag.

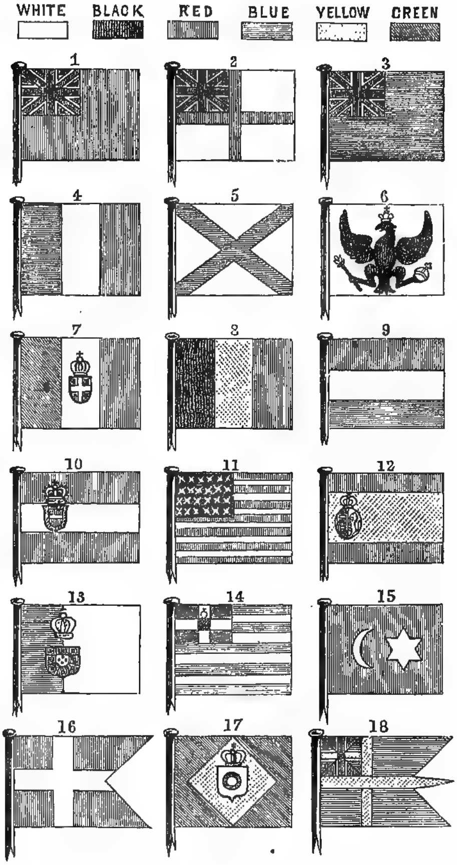
FLAG (common to the Teutonic languages, and derived from a root signifying to fly), a cloth of light material, capable of being extended by the wind, and designed to make known some fact or want to spectators. In the army, a flag is the ensign carried as its distinguishing mark by each regiment; and also a small banner, with which the ground to be occupied is marked out. In the navy, the flag is of more importance, often constituting the only means vessels have of communicating with each other, or with the shore. For this purpose, devices of conspicuous colours (usually black, white, red, yellow, or blue) are hoisted at the mast-head or at the gaff. The flags having three forms—viz.



1, the Square Flag; 2, the Pennant; 3, the Burgee.

A very few patterns in each shape give sufficient combinations of three or four flags to express any letter or word in the language. The flag is also a sign of the rank of the principal person on board a vessel, as the 'Royal Standard,' containing the arms of the United Kingdom, which is only hoisted when a member of the royal family is on board; the Anchor of Hope, on a red ground, denoting the Admiralty; the pennant, which specifies the admiral's squadron to which the ship belongs (see FLAG-OFFICER); and the ensign, which denotes the nation.

The ensigns borne by ships-of-war of the leading states of the world are as shewn below (in these diagrams, the direction of the lines shews the colour, as in heraldry), viz.:



Flags of the Principal Maritime Nations:

1, Britain, red ensign; 2, Britain, white ensign; 3, Britain, blue ensign; 4, France; 5, Russia; 6, Prussia; 7, Italy; 8, Belgium; 9, Holland; 10, Austria; 11, United States; 12, Spain; 13, Portugal; 14, Greece; 15, Turkey; 16, Denmark; 17, Brazil; 18, Sweden.

A white flag is accepted throughout the world as a token of peace; a red flag, as defiance; and a black flag denotes a pirate; a flag of plain yellow usually signifies that the vessel bearing it is in quarantine. See also UNION JACK.

FLAG OF THE PROPHET (Sanjak-Sherif) is the sacred banner of the Mohammedans. It was originally of a white colour, and was composed of the turban of the Koreish, captured by Mohammed. A black flag was, however, soon substituted in its place, consisting of the curtain that hung before the door of Ayeshah, one of the Prophet's wives. This flag, regarded by the Mohammedans as their most sacred relic, first came into the possession of the followers of Omar at Damascus; it afterwards fell into the hands of the Abbasi; then passed into those of the califs of Bagdad and Kahira; and, at a later period, was brought into Europe by Amurath III. It was covered with forty-two wrappings of silk, deposited in a costly casket, and preserved in a chapel in the interior of the seraglio, where it is guarded by several emirs, with constant prayers.

The banner unfolded at the commencement of a war, and likewise carefully preserved, is not the same, although it is believed by the people to be so.

FLAG-CAPTAIN, in the Navy, is the captain of the admiral's ship in any squadron, and is ordinarily his nominee.

FLAG-LIEUTE'NANT is an officer who, in the navy, performs such duties for an admiral as would devolve upon an aide-de-camp in the army. He communicates the admiral's orders to the various ships, either personally or by signal.

FLAG-OFFICER, in the British Navy, is an admiral, vice-admiral, or rear-admiral. He is so called from his right to carry, at the mast-head of the ship in which he sails, a flag denoting his rank. For an admiral, the flag is borne at the main; for a vice-admiral, at the fore; and for a rear-admiral, at the mizzen: the flag being, in either case, red, white, or blue, according to the squadron to which the officer belongs.

FLAG-SHIP, the ship in a fleet which bears the admiral's flag, and therefore forms a sort of centre to which all other vessels must look for orders. It is usually the largest vessel in the fleet.

FLA'GELLANTS, the name given to certain bodies of fanatical enthusiasts, who, at various intervals from the 13th to the 16th c., made their appearance in the different countries of Europe, proclaiming the wrath of God against the corruption of the times, inviting sinners to atone for sin by self-inflicted scourgings or flagellations, and themselves publicly enforcing this exhortation by voluntary scourging of themselves, and by other forms of self-castigation. In large and disorderly bands—frequently headed by priests, and by fanatics in the costume of priests and monks, bearing banners and crucifixes aloft, their breast and shoulders bare, and their face concealed by a hood or mask, each armed with a heavy knotted scourge, loaded with lead or iron—they marched from town to town, chanting hymns full of denunciations of vengeance and of woe. In the most public place of each town which they entered, they threw themselves upon the earth, with their arms extended in the form of a cross, and there inflicted upon themselves the discipline of scourging, frequently to blood, and even to mutilation. Each member enrolled himself for 33 days, in honour of the 33 years of the life of our Lord on earth; and all for the time professed entire poverty, subsisting only on alms or voluntary offerings. These fanatical movements, resembling, in some respects, at least, the religious revivals of our own time, recurred at frequent intervals. The most remarkable, however, are three in number. The first originated at Perugia in 1260, at a time when society in Italy was greatly disorganised by the long continued struggles of the Guelph and Ghibelline factions. The very disorders of the time prepared the way for this religious reaction. Numbers crowded to follow the new cry, until at last the body became so formidable as to draw upon itself the suspicions of Manfred, the son of Frederic II., by whom it was vigorously suppressed. Later offshoots of the party made their appearance in Bavaria, Austria, Moravia, Bohemia, Poland, and France; when to their extravagant practices, they added still greater extravagances of doctrine. In virtue of a pretended revelation, they asserted that the blood shed in self-flagellation had a share with the blood of our Lord in atoning for sin; they mutually confessed and absolved each other, and declared their voluntary penances to be a substitute for all the sacraments of the church, and for all the ministrations of the clergy. The Jews were to them an object of special abhorrence; and this unfortunate race, exposed at all times to every caprice of the popular will, suffered dreadfully from the fury of the Flagellants in many of the towns of Germany and the Netherlands. In the second outbreak of Flagellantism about 1349, the outrages against public decency were much more flagrant than at its first appearance. Men and women indiscriminately now appeared in public half naked, and ostentatiously underwent these self-inflicted scourgings. The immediate occasion of this new outburst of fanaticism, was the terror which pervaded society during the dreadful plague known as the Black Death, which Hecker, in his *Epidemics of the Middle Ages*, describes with terrible fidelity. The same extravagances were again repeated in Upper Germany, the provinces of the Rhine, the Netherlands, Switzerland, Sweden, and even England. Although rigorously excluded from France, these fanatics effected an entrance into Avignon, then the residence of the popes, when they were condemned by a bull of Clement VI. The mania gradually subsided, nor do we again find any permanent trace of it till the beginning of the next century. In the year 1414, a new troop of Flagellants, locally called *Flegler*, made their appearance in Thuringia and Lower Saxony, renewing and even exaggerating the wildest extravagances of their predecessors. These new fanatics appear to have rejected all the received religious usages, and indeed all external worship, placing their entire reliance on faith and 'flagellation.' Their leader was called Conrad Schmidt. They rejected not only the doctrines of the church upon the sacraments, but also purgatory and prayers for the dead. Schmidt pretended a divine mission; and proclaimed that the blood of flagellation was the true wedding-garment of the gospel; that it was more precious than the blood of the martyrs, and a sure passport to eternal life. The violence of these fanatics drew upon them the severest punishments of the Inquisition. Many of them were capitally condemned, and Schmidt himself was burned at Sangerhausen in 1414. Their doctrines, comprised in fifty articles, were condemned in the Council of Constance.

These strange extravagances are reprobated by the Roman Catholic Church in common with all other Christian communities; but Roman Catholics (relying on 1 Cor. ix. 27, Coloss. iii. 5) hold the lawfulness, and even the meritorious character, of voluntary self-chastisement, if undertaken with due dispositions, practised without ostentation or fanaticism, and animated by a lively faith and a firm hope in the merits of Christ. This is the self-castigation known under the name of 'the Discipline'—a form of mortification not unfrequent in the monastic state, and even practised by lay persons, and these sometimes of the highest rank, both in ancient and in modern times. Compare Forstemann's *Die Christlichen Geisslergesellschaften*, Wadding's *Annales Minorum Fratrum*, Raynaldi's *Continuation of Baronius*, Mosheim's *Church History* (Soames' ed.), Gieseler's *Kirchengeschichte*, Milman's *Latin Christianity*, and Wetsir's *Kirchen-Lexicon.*

FLA'GEOLET, a wind instrument with a mouth-piece like the common whistle. It is made of box-wood or ivory, in several pieces, and has holes for the fingers, like the flute. According to Burney, the flageolet was invented by Sieur Juvigny in 1580.

FLAGEOLET-TONES is the name given to the harmonic notes of the violin, violoncello, and other stringed instruments, which notes are produced by the finger lightly touching the string on the exact part which generates the harmony, and not by pressing the string down to the finger-board. The string vibrates on both sides of the finger, the long side dividing itself into parts of the same length as the short side. See Harmonics. The inventor of the manner of playing flageolet-tones is said to have been Domenico Ferrari. The best work on the subject is by Collinet.

FLA'GSTONE, a rock which splits into tabular masses, or flags of various size and thickness, in the original plains of stratification. Flagstones are generally sandstones, combined with more or less argillaceous or calcareous matter; some, however, are indurated clays, and others thin-bedded limestones. They are used for paving, cisterns, &c. The most famous are those of Festiniog (North Wales), remarkable for their large size, even grain, and great beauty; those of Yorkshire, also of large size, and of great hardness and toughness; and those of Caithness, which are extremely tough and durable. The Caithness flags belong to the Old Red Sandstone; the Yorkshire are taken from the millstone grit division of the Coal Measures.

FLA'MBOROUGH HEAD (Saxon, *Fleamburgh*), a promontory of the Yorkshire coast, and forming the northern boundary of Bridlington Bay. It terminates a range of white perpendicular chalk cliffs, 6 miles long, and 300 to 450 feet high. Its rugged sides contain many caverns, and in the sea near are picturesque chalk rocks, which swarm with sea-birds. The chalk contains fossil sponges, crinoids, &c. On the Head is a lighthouse, 214 feet high, seen 19 miles off, and in lat. 54° 7′ N., and long. 0° 5′ E. Across the peninsula, ending in the Head, runs a ditch, with two lines of defence and breast works, called Dane's Dyke, but really an ancient British work.

FLAMBOY'ANT, the latest style of Gothic architecture which prevailed in France. It prevailed there during the 15th and part of the 16th centuries, and corresponds to the Perpendicular (q. v.) in England. The name is derived from the flame-like forms of the tracery of the windows, panels, &c. (fig. 1). The characteristics of this style are minute and elaborate ornament, combined with general bareness of surface. The crockets, for instance, are generally cut into a great number of small leaves, while they are placed far apart; the mouldings are divided into large empty hollows, and small thin fillets and beads; the finials have crockets minutely carved, set upon bare pyramidal terminals; the arch-mouldings are divided into a great number of small parts, and want the boldness and decision of the earlier styles. These mouldings are frequently abutted on the pillars, or continued down them without any caps; and when there are caps, they are small and without effect. See fig. 2. When mouldings join, they are frequently run through one another, so as to appear to interlace. The effect is intricate rather than beautiful, suggestive, like the rest of the style, of ingenuity in stone-cutting rather than art. The doorways and windows are sometimes large and fine (as in fig. 1); but while these are highly enriched, the general surface of the building is left too plain. There are many large buildings in France executed in this style, but it is usually portions only which are fine, not the general effect. Some of the spires of this period are also very beautiful. The north spire of Chartres Cathedral, for example, is considered one of the finest in France.

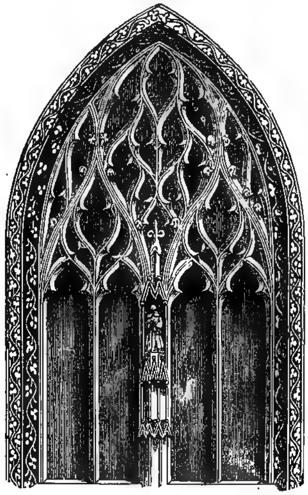


Fig. 1.—Window, Harfleur.

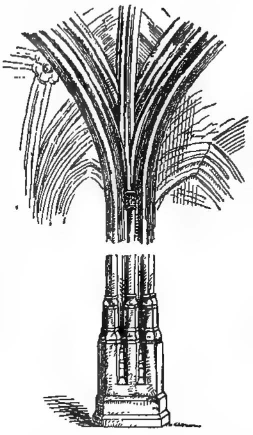


Fig. 2.

FLAME is a particular form of Combustion (q. v.) or burning. Ordinary combustion consists in the oxygen of the atmosphere combining with some combustible substance so rapidly as to give out light and heat. When the combustible is either originally a gas, or becomes so by the heat, the combustion takes the form of flame. Flame, then, is the burning of a gas. In most cases, the gas of flame is a compound of hydrogen and carbon, with minute particles of solid carbon suspended in it, and is formed from the fuel (coal, tallow, &c.) being decomposed by the heat. The heat and light of flame vary with the gas: hydrogen produces great heat, but little light. The lighting power of a gas depends upon the proportion of carbon it contains, the particles of which become glowing hot before being consumed.

The flame of a lamp or candle, or simple gas-jet, consists of a hollow cone, in the centre of which there is no combustion. The central space appears dark only by contrast with the luminous cone which surrounds it. It consists, in reality, of transparent invisible compounds of carbon and hydrogen, which are constantly rising in vapour from the wick. If a glass tube, open at both ends, be held obliquely in the flame of a candle, with its lower extremity in the dark central space above the wick, it will conduct away a portion of the combustible vapour, which may be kindled like a gas-jet at its upper end, as represented in fig. 1. This dark portion of the flame may be called *the area of no combustion.*

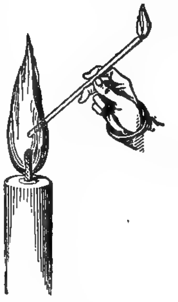


Fig. 1.

The luminous cone which envelops the dark space is *the area of partial combustion.* The oxygen of the atmosphere penetrates to this depth, but not in sufficient quantity to oxidise or burn both the carbon and the hydrogen; it therefore unites with the hydrogen, for which it has the stronger attraction, and leaves the carbon free. The outer cone is named *the area of complete combustion,* because there the carbon meets with sufficient oxygen to burn it entirely. The light is produced in the area of partial combustion, where the carbon is set free from the hydrogen in the form of solid particles, and is heated to whiteness by the combustion of the hydrogen. The combustion of the carbon in the outer cone, by which it is converted into carbonic acid gas, produces heat, but so little light as to be barely traceable.

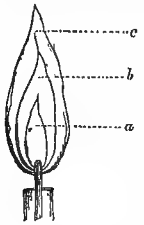


Fig. 2.

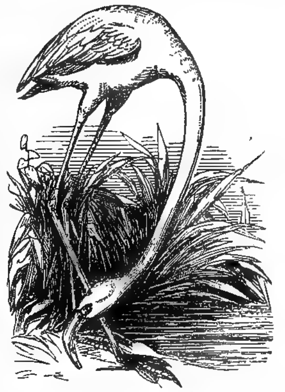
a, area of no combustion; *b*, area of partial combustion; *c*, area of complete combustion.

That carbon exists in a solid state in the white part of a flame, is readily shewn by holding a piece of white earthen-ware into it, which becomes coated with carbon in the form of soot. No soot is deposited in the dark or no-combustion area of the flame, because there the carbon is in chemical combination with hydrogen, forming a gas. The carbon becomes solid only when the hydrogen deserts it, as it were, to unite with oxygen.

The highly illuminating power of compounds of hydrogen and carbon is thus traced to the fact, that *their hydrogen and carbon do not burn simultaneously, but successively, and in such a way that the one heats the other white hot.* It is quite possible to make them burn simultaneously; but when they do, the light evolved is very feeble. This takes place in the 'Bunsen burner,' in which air is allowed to mix with the gas before combustion.

FLA'MENS were priests in ancient Rome devoted each to some special deity. There were fifteen in all. The chief of these (*Flamines Majores*) were the flamens of Jupiter, of Mars, and of Quirinus, who were always patricians; the remaining twelve (*Flamines Minores*) were chosen from the plebeians. The flamens were elected at first by the *Comitia Curiata,* but afterwards by the *Comitia Tributa,* and were installed into their office by the supreme dignitary of the Roman pagan religion, the *Pontifex Maximus.* The flamen of Jupiter was a privileged person; he was not required to take an oath, was attended by a lictor, his house was an asylum, and he had a seat in the senate. But all this was attended by numerous superstitious restrictions: he might not have a knot on any part of his attire, nor touch flour, or leaven, or leavened bread; he might not touch or name a dog, or mount a horse, or be a night out of the city, &c. His wife, called Flaminica, was subjected to similar restrictions, and when she died, the flamen was obliged to resign. The majority of Roman writers attribute the institution of flamens to Numa.

FLAMI'NGO (*Phœnicopterus*), a genus of birds which until recently was placed by all naturalists among the *Grallatores* (Waders), but is now generally ranked among the *Palmipedes,* and even referred to the family of *Anatidæ.* The bill is large, deeper than broad, and suddenly curved downwards near the middle, so that, as the bird wades and seeks its food, either in the water or in the mud, it makes use of the bill in a reversed position, the upper mandible being lowest. The edges of both mandibles are furnished with small and very fine transverse laminæ, which serve, like those in the bills of the ordinary *Anatidæ,* to prevent the escape of the small crustaceans, molluscs, worms, small fishes, seeds, &c., which are the F.'s food, and to separate them from the mud with which they may be mingled. The upper surface of the tongue is also furnished on both sides and at the base with numerous small flexible horny spines, directed backwards. Unlike the ordinary *Anatidæ,* flamingoes have great part of the tibia, as well as the tarsus, naked, in this resembling all the Waders. They are birds of powerful wing, and fly either in strings or in wedge-shaped flocks like geese, a single bird leading the way for the flock. They seldom make use of their webbed feet for swimming, to which the length of their legs is not well adapted, the use of the membrane being rather to support them on soft muddy bottoms. When feeding, they keep their feet in almost constant motion, as if to stir the mud. Hundreds may sometimes be seen feeding together in the shallow waters or salt marshes of tropical coasts, chiefly of Asia and Africa, or on the banks of rivers or inland lakes, and by their large size and rich colours making a brilliant spectacle. They make their nests in marshes, scraping together a heap of mud, on the top of which is the nest; and it is said that the long legs of the female F. often hang down into the water during the incubation, not being easily disposed of otherwise.—There are several species of F., but very similar to each other, both in appearance and habits. One species only visits the south of Europe, the Common F. (*P. ruber*), a bird measuring fully four feet from the tip of the bill to that of the tail, and six feet from the tip of the bill to the claws; the male, when in full plumage, is of a rose-red colour, with deep purple wings; the female, and the young for several years, are less brilliant, the young at first being whitish, and the red first appearing on the wings.—The AMERICAN F. (*P. Americanus* or *Chilensis*) is of a more orange tint, and is abundant on many parts both of the eastern and western coasts of America.



Flamingo (*Phœnicopterus ruber*).

FLAMI'NIAN WAY (*Via Flaminia*), the great northern road of ancient Italy, leading from Rome to Ariminum (*Rimini*) on the Adriatic. It was constructed by C. Flaminius during his censorship (220 B. C.), and was designed to secure a free communication with the recently conquered Gaulish territory. The F. W. was one of the most celebrated and most frequented roads of Italy both during the period of the Republic and of the Empire. Its importance may be estimated from the fact, that when Augustus (27 B. C.) appointed persons of consular dignity road-surveyors for the other highways of his dominions, he reserved the care of the F. W. for himself, and renewed it throughout its whole length. Its general direction was northerly. Leaving Rome, it kept for the most part at no great distance from the Tiber till it reached Narnia (*Narni*), where it struck off in a north-easterly direction, passing Interamna (*Terni*) and Spoletium (*Spoleto*), and reaching the foot of the Apennines, at Forum Flaminii. Crossing the central ridge of the Apennines, at Ad Ensem (La

Schieggia ?), it again proceeded in a northerly direction, pursuing much the same line of route as the modern road from Foligno to Fano, and reached the Adriatic at Fanum Fortunæ (Fano), whence it wound along the coast to Ariminum (Rimini), where it ended, or rather where the name ceased; for the Via Æmilia (see EMILIAN PROVINCES) was just a continuation of it. The whole length of the road from Rome to Ariminum was (according to the Jerusalem Itinerary), 222 miles, and according to the Antonine, 210 miles. Remains of it still exist at various places, and assist the antiquary in tracing its direction.

FLAMSTEED, JOHN, the first astronomer-royal of England, for whose use the Royal Observatory at Greenwich (called Flamsteed House) was built, was born near Derby, 19th August 1646, and early devoted himself to mathematical and astronomical pursuits. While yet a youth, he mastered the theory of the calculation of eclipses; and his calculations of some remarkable eclipses of the moon were the means of introducing him to the notice of the eminent scientific men of his time, among others to Sir Jonas Moore, then Surveyor-general of the Ordnance, through whom, and in connection with whose department, he was appointed astronomer to the king in 1675. The year following, the Observatory at Greenwich was built, and F. began that series of observations that constitute the commencement of modern practical astronomy. He formed the first trustworthy catalogue of the fixed stars, and furnished those lunar observations on which Newton depended for the verification of his lunar theory. Extracts from the papers of F., found in the Observatory by Mr Francis Baily, and published by authority of the Admiralty in 1835, brought to light a very sharp quarrel that had taken place between F. and Newton and Halley with regard to the publication of the results of F.'s labours. The *Historia Cœlestis Britannica*, his great work, in three vols., giving an account of the methods and results of astronomical observation up to his time, was begun to be printed before his death in 1719, but was not published till 1725. It may be mentioned that F., while following his scientific pursuits, qualified himself for holy orders, and in 1684 was presented to the living of Burslow, in Surrey, which he held till his death.

FLANCHES, or **FLANQUES**, in Heraldry, are composed of arched lines drawn from the upper angles of the escutcheon to the base points. The arches of the flanches almost meet in the centre of the shield. The Flanches are an ordinary little used in Scotch heraldry.

FLANCONNADE, a thrust in Fencing (q. v.).

FLA'NDERS was formerly the name of an extensive and almost independent territory ruled by 'counts,' and embracing, besides the present Belgian provinces of the same name, the southern portion of the province of Zealand in Holland, and some of the departments in the north-east of France. Cæsar found this district inhabited by the Morini, the Menapii, and the Nervii, and having conquered these tribes, he annexed the country. Under the rule of the Franks, the river Scheldt, which flowed through the district, formed the boundary line between Neustria and Austrastia, in consequence of which the northern and south-western part of the territory comprised under the term F., although its population was decidedly Germanic, came to belong to France, while the south-east, although to a large extent non-Germanic, was after 1007 included in the German Empire. F. obtained its name from the *Vländergau* (*pagus Flandrensis*, the district around Bruges and Sluis), whose counts had been made wardens of the north-eastern coasts of France at the period of the incursions of the Normans, in the latter half of the 9th c., and who extended the name of their hereditary possessions to the whole district which they governed. The first count or markgraf of the country is said to have been Baldwin, surnamed *Bras de Fer* (Iron-Arm), who married Judith, the daughter of King Charles the Bald of France, and widow of Ethelwulf, king of England, and afterwards received the newly created 'mark' or county, in 864, as a hereditary fief from his father-in-law. He extended his territories by the addition of Artois, which was held by his successors until Philippe Auguste reunited it to France. He died in 879, but not until he had inaugurated the industrial greatness of F. by introducing into it a great number of workmen skilled in the manufacture of woollen and other goods. Baldwin IV., or the Bearded, one of the successors of Baldwin *Bras de Fer*, received in fief from the Emperor Henry II. the burgraviate of Ghent, Walcheren, and the islands of Zealand, and thus became a prince of the German empire. He was succeeded by his son Baldwin V., or the Pious (1036—1067), who increased his possessions by the addition of the German territory between the Scheldt and the Dender, belonging to the duchy of Lower Lorraine. To this he added Tournay, the supremacy over the bishopric of Cambray (to which, till the erection of the new bishopric of Arras, the county of Flanders had been ecclesiastically subordinate), and the county of Hainault. During the Middle Ages, F. figured prominently in the political affairs of Europe—the counts of F. being more powerful and wealthy than many European kings. Baldwin IX., the founder of the Latin kingdom at Constantinople, died in 1206, leaving two daughters, one of whom died without children; the other bequeathed Hainault to John of Avennes, her son by her first marriage; and F. to Guy Dampierre, her son by a second marriage. Meanwhile, the industrial prosperity of the cities of F. had become so great, that the citizens began to feel their own power, and to claim independence. They formed republican communities like the free cities of Germany, with this difference, that they admitted the nominal suzerainty of the counts. But they were not afraid to take up arms in defence of their liberties against their nominal masters. Witness the insurrection headed by Jakob van Artevelde (q. v.) against the cruel government of Count Louis I. On the marriage of Marguerite, the daughter and heiress of Louis II., Count of Flanders, to Philip the Bold of Burgundy, the country was united to the Burgundian territories in 1384, and afterwards shared the fortunes of that duchy. The dukes of Burgundy brought great part of the former duchy of Lower Lorraine under their dominion, and thus laid the foundation for the subsequent union of the states of the Netherlands, in which F. continued to form one main component part. On the death of Charles the Bold, these territories passed, in 1477, to the House of Hapsburg, by the marriage of his daughter Mary to the Archduke Maximilian. After Burgundy had passed with King Philip II. to the Spanish line of the House of Hapsburg, the territory of F. was considerably diminished, as not only was the portion called Dutch Flanders transferred to the Estates-general by the peace of Westphalia, but, in the time of Louis XIV., France seized upon another portion of F., as also a part of Hainault, Cambray, and Artois, and was confirmed in her possession by the peace of Aix-la-Chapelle, of Nimeguen, and of Utrecht. By the last, and by the treaty of peace concluded at Rastadt, the remains of the Spanish Netherlands again fell into the hands of the House of Austria. In 1794, F., like the other provinces of Belgium, was incorporated with the French Republic, and afterwards with the Empire, and formed the departments of Lys and Escaut; the Congress of Vienna, however, conferred these portions on the new kingdom of the Netherlands, with which they remained united till the formation of the kingdom of Belgium (q. v.). The Belgian portion of F. is now divided into the provinces of East and West Flanders (q. v.).—Compare Praet, *Histoire des Comtes de Flandres, et de l'Origine des Communes Flamandes* (Brussels, 1828); Le Glay, *Histoire des Comtes de Flandres jusqu'à l'Avènement des Ducs de Bourgogne* (2 vols., Paris, 1843); Kervyn van Lettenhoven, *Histoire de Flandres* (6 vols., Brussels, 1847—1851), &c.

FLANDERS, East, a province in the north-west of Belgium, is bounded on the E. by the provinces of Antwerp and Brabant, on the S. by that of Hainault, on the W. by that of West Flanders, and on the N. by the Dutch province of Zealand. It has an area of 1146 square miles, and a population which amounted in 1859 to 791,843, or 690 to the square mile. East F. is the most populous province of the most populous country in Europe. See Belgium. It is watered mainly by the Scheldt, and by its affluents the Lys and the Dender. The surface is low and level. The soil has been rendered extremely fertile by means of spade cultivation and an excellent manuring system. Besides the ordinary varieties of grain, potatoes, flax, hemp, and hops are produced in great quantity. The district in the north-east of the province, between the towns of Antwerp and Ghent, is celebrated as a flax-growing quarter. The manufactures are chiefly lace, damasks, linens, woollens, bobbin-net, silk, and cordage; sugar-refining, brewing, and distilling are also carried on. Chief towns, Ghent, Alost, and Dendermonde.

FLANDERS, West, the most western province of Belgium, is bounded on the N. by the North Sea, and on the W. and S. by France. Its area is 1237 square miles, and its population in 1859 amounted to 634,918. Its chief rivers are the Lys and the Iser; but it is watered by numerous smaller streams, and is intersected by many important canals. Its surface is flat, with sandy hills in the south and along the coast; and its soil sandy, but well cultivated and productive. It has fewer products and manufactures than East Flanders. Chief towns, Bruges, Courtrai, and Ostend.

FLANGE, a rim or projection upon a tube or cylinder of metal or other material, to serve as a bearing, or afford means of fixing it; for example, the projecting rim on the tires of the wheels of railway-carriages is called a flange.

FLANK (the side), a word used in many senses in military matters. *Flanks of an army* are the wings, or bodies of men on the right and left extremities, prepared to close in upon an enemy who shall attack the centre. *Flank files* are the soldiers marching on the extreme right and left of a company or any other body of troops. *Flank company* is the company on the right or left when a battalion is in line; the grenadier and light infantry companies usually occupy these positions, and are known as flank companies, whether with the remainder of the regiment or not. A *flanking party* is a body of horse or foot employed in hanging upon and harassing the flank of an enemy's force.—Flank, as applied in Fortification, will be best described under that article (q. v.). The *flanks of a frontier* are certain salient points in a national boundary, strong by nature and art, and ordinarily projecting somewhat beyond the general line. The effect of these flanks is to protect the whole frontier against an enemy, as he dare not penetrate between them, with the risk of their garrisons, reinforced from their own territories, attacking his rear, and cutting off communication between him and his base. Silistria and Widin were flanks of the Turkish frontier during Omar Pasha's campaign in 1853 and 1854. Similarly, in the event of an invasion of England from the coast of Sussex or Kent, Portsmouth and Chatham would be formidable flanking garrisons, which would almost necessarily have to be subdued before the invader could march on London.

In evolutions, 'to flank' is to take such a position with troops as either to aid one's own army in an attack on the enemy, by leading the latter to suppose that his flanks are in danger in his present position, or to prevent him from advancing on one's comrades by threatening his flanks if he should do so. To *outflank* is to succeed by manœuvres in commanding the flank of an enemy who has been, on his part, endeavouring to flank one's own force.

FLANNEL (Welsh, *gwlanen*, from *gwlan*, wool, allied to Lat. *lana*), a woollen fabric, differing from broadcloth and most other woollen fabrics in being woven of yarn more loosely twisted, and having less dressing. The best flannel is made in the neighbourhood of Welshpool and Newtown, in Wales, from the wool of the Welsh mountain-sheep, and is commercially known as Welsh flannel. Large quantities are also made in West Lancashire, West Yorkshire, and the neighbourhood of Leeds. A more closely spun and woven flannel, used for cricketing and rowing shirts, &c., and dyed and printed with various colours and patterns, is made in the west of England cloth-making district, in the vicinity of Stroud, in Gloucestershire. Fine light flannel of this kind is made in France and Belgium; some of this is twilled, and approaches nearly in quality to French merinoes, but is much softer. The demand for this sort of fancy-shirting flannel has of late become considerable, and has led to the production of many varieties, which, though bearing the name of flannel, vary so materially from the original Welsh flannel, that they can scarcely be included with them under any general definition. Coarse flannel, called *Galways*, is made in Ireland, and is chiefly used by the peasantry of the country.

FLAT, a musical character, shaped thus ♭, which, when placed before a note, lowers that note half a tone. When placed at the beginning of a piece of music, it denotes that all the notes on the line or space on which it is placed, with their octaves above and below, are to be played flat.

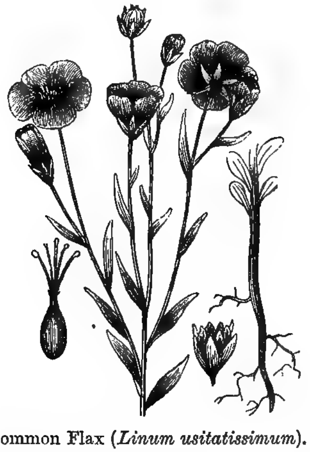
FLAT-FISH, a popular name of the fishes of the family *Pleuronectidæ* (q. v.), as the flounder, plaice, sole, turbot, halibut, &c.; which have the body much compressed, and the sides unsymmetrical, swimming on one side. It is sometimes extended in its signification so as to include skates and other fishes of the Ray (q. v.) family, which are very different, being cartilaginous fishes, quite symmetrical, and swimming on the belly, although, like the *Pleuronectidæ*, generally keeping close to the bottom. It is never applied to the much compressed symmetrical fishes, such as the dory, which swim in the ordinary posture of fishes, the dorsal edge upwards, the ventral downwards.

FLATTERY, Cape, a headland of Washington territory, on the Pacific coast of the United States, marks the south side of the entrance of the Strait of Juan de Fuca. It is in lat. 48° 24′ N., and in long. 124° 40′ W.—Another headland of the same name is found on the east coast of Australia, in lat. 14° 52′ S., and long. 145° 20′ E. It is about 30 miles to the north of Endeavour Bay.

FLA'TULENCE, distention of the stomach or bowels by the gases formed during digestion. See Indigestion.

FLAVINE, or **FLAVIN**, is a yellow colouring matter employed in dyeing, and imported in the condition of extract. It is understood to be the colouring matter of bark (quercitron bark), and is used in place of quercitron bark. When treated with hot water, flavine yields a yellow turbid solution, which, on settling, deposits a yellow-brown powder. When employed in dyeing, the cloth is first treated with an aluminous mordant (see Calico-printing); and on subsequent immersion in the solution of flavine, a fine yellow colour is fixed on the cloth. The colouring power of the extract flavine as imported is so great that one ounce is equal in dyeing qualities to one pound of quercitron bark.

FLAX (*Linum*), a genus of plants comprising the greater part of the natural order *Linaceæ;* an exogenous order allied to *Geraniaceæ* and *Oxalideæ*, and consisting of annual and perennial herbaceous plants, with a few small shrubs. There are about ninety known species of this order scattered over the globe, but most abundant in Europe and the north of Africa. Their leaves are simple, entire, without stipules, and generally alternate. The Common Flax or Lint (*L. usitatissimum*) is an annual; a native of Egypt, of some parts of Asia, and of the south of Europe, not truly indigenous in Britain, although now naturalised, and often occurring in cornfields, which is the case also in many parts of the world. The most common variety of the flax plant has a very slender erect stem, two or three feet high, branching only near the top, so as to form a loose corymb of flowers. The leaves are small, distant, and lanceolate; the flowers of a beautiful blue, rarely white, rather broader than a sixpence; the petals slightly notched along the margin; the sepals ovate, 3-nerved, ciliated, destitute of glands; the capsules scarcely longer than the calyx, not bursting open elastically, but firmly retaining their seeds, which are dark brown, glossy, oval-oblong, flattened, with acute edges, pointed at one end, and about a line in length. Another variety, however, is cultivated to some extent in many parts of Europe, so different, that some botanists account it a distinct species (*L. humile* or *L. crepitans*), which is less tall, is more inclined to branch, and is particularly distinguished by its capsules, twice as long as the calyx, and bursting open elastically when ripe. The seeds are also larger and paler. This variety is called *Springlein* and *Klanglein* by the Germans, the one name referring to the elastic bursting of the capsules, the other to the sound which accompanies it. The former variety is known to them as *Winterlein*, being often sown in the end of autumn in elevated districts where the summer is too short for spring-sown flax, and also as *Schlieszlein* and *Dreschlein*, from its close capsules and the thrashing needed to separate the seed. The *Springlein* produces a finer, whiter, and softer fibre than the other, but shorter, and it is therefore not so extensively cultivated. There are many sub-varieties, to which and their different qualities no such attention has been paid, in Britain at least, as to those of other important cultivated plants.



Common Flax (*Linum usitatissimum*).

This plant is highly valuable both for the fibres of its inner bark and for its seeds. The fibres of the inner bark, when separated both from the bark and from the inner woody portion of the stem, are Flax or Lint, the well-known material of which Linen thread and cloth are made, and used equally for the finest and for the coarsest fabrics, for the most delicate cambric or exquisite lace, and for the strongest sail-cloth. The seeds yield by expression the *drying* fixed oil called Linseed Oil, so much used for mixing paints, making varnishes, &c.; whilst the remaining crushed mass is the Linseed Cake, or Oil-cake, greatly esteemed for feeding cattle, and when ground to a fine powder, becomes the Linseed Meal so useful for poultices. Linseed is sometimes used in medicine, as an emollient and demulcent in irritations of the pulmonary and of the urinary organs, and of the mucous membranes generally, deriving its value for this purpose from a mucilage which it contains, and which is extracted by hot water, making *linseed tea.* The fibre of flax is the ultimate material from which paper is made, and linseed oil is used in the manufacture of printers' ink. No plant not yielding food is more useful to man than the flax plant.

It has been cultivated from the earliest historic times. It is mentioned in the book of Exodus as one of the productions of Egypt in the time of the Pharaohs; and it has been recently ascertained by microscopic examination, that the cloth in which the mummies of Egypt are enveloped is linen. Solomon purchased linen yarn in Egypt. Herodotus speaks of the great flax trade of Egypt. Great quantities of flax are grown in that country at the present day; its cultivation is also very extensively carried on in some parts of Europe and of North America. The proportion of flax to other crops in Britain is probably smaller at present than it was at a former period, but an increase of its cultivation has been strongly recommended by persons whose opinion is entitled to great regard, and particularly in Ireland, where, however, it is more extensively cultivated than either in England or Scotland. It has the advantage of giving employment not only to an agricultural but to a manufacturing population. Flax is more extensively and more successfully cultivated in Belgium than in any other European country, particularly in Southern Brabant, Hainault, and West and East Flanders, in which the most beautiful flax in Europe is produced, employed for the manufacture of the famous Brussels lace, and sold for this purpose at about £100 to £180 per ton, the crop when prepared for the market sometimes exceeding in value the land on which it was produced. The village of Rebeque is distinguished for the production of this precious flax. The greatest care is bestowed on its cultivation, and to this its excellence is probably in a great measure to be ascribed. Not a weed is to be seen, and the care and labour are equal to those of gardening. Flax is extensively grown in the countries on the southern shores of the Baltic, and both the fibre and seed are largely imported from them into Britain. Besides the flax raised at home, Great Britain annually imports from 80,000 to 90,000 tons of this material.

Flax has been cultivated from time immemorial, as a winter crop, in India, but only for its seed, and not at all for its fibre. This remarkable circumstance is supposed by Dr Royle to be owing to the existence of the cotton plant in that country, the fibre of which more readily offers itself to view on the bursting of the pod. But Dr Royle also states his opinion, that the climate of the greater part of India is unsuitable for the production of the fibre of flax; and the variety cultivated in India is only about a foot or eighteen inches in height, much branched, and yielding a very worthless fibre, whilst it is loaded with capsules, and the seeds yield a larger proportion of oil than those of flax grown in Europe. It is sometimes sown as an edging around fields.

Much depends on the thickness of sowing. Flax must be sown thick to yield a fine fibre; but when intended to produce a fibre for coarser purposes, the plants ought to have more room. For the finest fibre, also, they must be pulled before the seed is ripe; but a coarser fibre and a crop of linseed are often much to be preferred by the farmer. The crop is always *pulled* up by the roots.

The diminished cultivation of flax in Britain, after agriculture began to improve, is to be ascribed in part to the prevalence of the opinion, that it is a very exhausting crop for the land. This has been said to be particularly the case when the seed is ripened. But the introduction of new manures has rendered this objection less important than it formerly was; and it has been found that the refuse of flax itself is not a bad manure, and that the water in which it has been steeped is a good liquid manure. The water of flax-steeping pits or ponds is often strong enough to kill the fish of rivers into which it is allowed to flow.

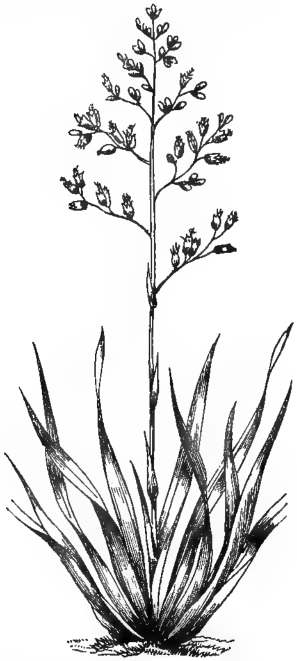
The capsules (*bolls*) of flax are torn off, after it is pulled, by a sort of combing called *rippling* (see FLAX-DRESSING). Great care is requisite to dry them, and to keep them perfectly dry. For the subsequent processes, see LINSEED.

Besides the common flax, several other species are occasionally cultivated for their fibre, but are comparatively of very little value.

The *Linaceæ* are, in general, plants of elegant appearance and with flowers of much beauty; some of them have flowers larger than common flax, and some are not unfrequent ornaments of our green-houses. *Radiola millegrana*, All-seed, is one of the smallest of British phanerogamous plants.

PURGING FLAX (*Linum catharticum*) is a graceful little annual with branching stem, opposite leaves, and small white flowers, common in fields and meadows throughout Britain and most parts of Europe. It possesses purgative and diuretic properties, owing to the presence of a substance which has been called *linin*. As a domestic medicine, a handful of the fresh herb is often administered, infused in whey; and it has a popular reputation in rheumatism.

FLAX, NEW ZEALAND, a valuable fibre quite different from common flax, and obtained from the leaf of an endogenous, instead of the stem of an exogenous plant. The plant yielding it is *Phormium tenax*, often called New Zealand Flax, and sometimes Flax Lily and Flax Bush. It belongs to the natural order *Liliaceæ*, and is a perennial plant, a native of New Zealand and Norfolk Island; its leaves resemble those of an Iris, are from two to six feet long and one to two or three inches broad. The flowers are produced in a tall branched panicle; are numerous, brownish yellow, not very beautiful; the fruit is a three-cornered capsule with numerous compressed jet-black seeds. The fibre of the leaves is both very fine and very strong, and was used by the New Zealanders, before their country was discovered by Europeans, for making dresses, ropes, twine, mats, cloth, &c. New Zealand Flax is imported into Britain for making twine and ropes; and the plant is cultivated in its native country. Its cultivation has also been attempted in some parts of Europe; but the winters of Europe, except in the south, are too cold for it. To obtain the fibre, the leaves are cut when they have attained their full size, and usually macerated for a few days in water. But the New Zealanders procure the fibre in its greatest perfection, very long and slender, shining like silk, by a more laborious process, and without maceration, removing the epidermis from the leaf when newly cut, separating the fibres by the thumb-nails, and then more perfectly by a comb.



New Zealand Flax (*Phormium tenax*).

The roots are purgative, diuretic, sudorific, and expectorant; a good substitute for sarsaparilla.—The leaves, when cut near the root, exude a viscid juice, which becomes an edible gum.—The New Zealanders prepare a sweet beverage from the flowers.

FLAX-DRESSING. When the seeds are beginning to change from a green to a pale brown, is the best time for pulling flax. Where the crop grows of different lengths, these lengths should be pulled and kept separately, uniformity in this respect being of great value in the after-processes.

The process first gone through after pulling is *rippling*—which consists in tearing off the bolls by pulling the stalks through a series of iron teeth 18 inches long, placed within a distance of half an inch of each other. These are fastened in a block of wood, which is placed at the end of a plank or long stool on which the operator sits.

The next process is to obtain the flaxen fibre or lint free from the woody core, or *boon*, of the stem. This is effected by steeping the bundles in water till the boon begins to rot, in which state it is readily separated from the fibre. The operation is called rotting or *retting*, and requires to be managed with great care, as by continuing it too long, decomposition might extend to the fibre, and render it useless; while by discontinuing it too soon, the separation could not be effected with sufficient ease. The time is generally determined by the nature and temperature of the water, and the ripeness of the flax—decomposition taking place more rapidly in soft stagnant water than in running streams, in which the retting is sometimes conducted. After being sufficiently steeped, the flax is spread out on the grass, to rectify any defect in the retting, and ultimately to dry it for the breaking. In some districts, it is the practice to conduct the retting entirely on the grass—a process known as dew-retting, in contradistinction to water-retting. This is a safer and less offensive method, but it requires much longer time, and in a country where land is valuable, would become very expensive. On the whole, the mixed method of retting is preferable—that is, to steep till decomposition of the boon is well advanced, and then to complete the process on the grass. It has been attempted to separate the fibre by machinery, without subjecting the flax to retting; but the article so produced has hitherto been rejected as inferior in quality.

To avoid the delays and uncertainty dependent upon the old processes of retting or watering, plans have been recently introduced, bringing the operation more under control, like the other processes of our manufactures. The methods which have been adopted, and are now working with success, are known as Schenk's and Watt's. By the first of these, the flax is placed in vats, in which it is kept down by means of strong framework. Water is allowed to pass into the vats, to become absorbed by the flax; steam is next admitted, till the temperature of the water is raised to, and maintained at, about 90°. Acetous fermentation ensues in a few hours; and after being maintained for about sixty hours, the decomposition of the gummy or resinous matter in the stalk is completed. The mucilage water is next withdrawn from the vat, and the flax taken out, separated and dried either in the open air or in desiccating rooms, according to circumstances. In Watt's process, the flax is placed in a chamber provided with a perforated false bottom; the top is double, and filled with water to act as a condenser. Steam being admitted to the case, the first result is the freeing of the flax from certain volatile oils. The steam rising to the top of the chamber is condensed by contact with it, and falls in showers on the flax beneath—a decoction of the extracted matter is thus obtained. In 36 hours, the process is completed; and the flax taken out, is passed between rollers in the direction of its length, which presses out the water and decomposed gum, and splits and flattens the straw. By this process, all that the plant takes from the land is saved—the seeds being available as food for animals, and the chaff and refuse water as manure.

Prepared by either of the plans, the flax is now ready to be freed completely of its woody particles. This is effected by *scutching*. Previous to this, however, the flax is passed through a *brake* or revolving rollers, in order thoroughly to crack the boon. The brake, worked by manual labour, consists of a frame, in the upper side of which are a number of grooves; a movable piece is hinged at one end, and provided with a similar grooved piece on its lower side, but so placed that the projections pass into the hollows of the lower. The flax, placed between these, and struck by bringing down the hinged part, is broken, but the fibre remains uninjured.

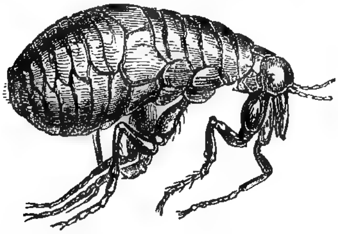
In the flax-breaking machine, the flax is passed through a series of horizontal fluted rollers; the flutes do not touch, thus preserving the fibre while breaking the boon. In continental countries, scutching is almost invariably performed by hand, the flax being held in a groove made in an upright stand, and struck by a flat blade. Machine-scutching is much more certain and expeditious than hand-scutching, and is, in consequence, fast superseding it in this country. After passing through the breaking-machine, the flax is subjected to the action of a series of knives, attached to the arms of a vertical wheel; these knives strike the flax in the direction of its length. The process is gone through three times before the flax is ready for the market. Although machine-scutching is expeditious, it is not capable of that pliant adaptation to the varying nature of the flax to be operated upon, which is obtained in hand-scutching. The effect of machine-scutching is to produce fineness by reducing and impairing, rather than sustaining, the character of the fibre—namely, the length and fineness of its 'staple' or fibre. To remedy these defects, scutching by means of revolving brushes has been introduced. This divides the fibre without tearing it. The subsequent manufacturing operations will be noticed under LINEN MANUFACTURE.

FLAXMAN, JOHN, the greatest of English sculptors, was born at York, 6th July 1755. At the age of 15, he became a student in the Royal Academy, but never worked in the studio of any master. In 1782, he married Miss Ann Denman, a lady of superior gifts and graces, who soon began to exercise a beneficial influence upon his studies. Accompanied by her, he went in 1787 to Italy, where, by degrees, he attracted the attention of all lovers of art. This was still more the case after his return to London in 1794. He was elected an Associate of the Royal Academy in 1797; Royal Academician in 1800; and, in 1810, was appointed Professor of Sculpture to that institution. After the death of his wife in 1820, he withdrew from society, and died 7th December 1826. F.'s most celebrated works are his 'Outlines to Homer's Odyssey' (Rome, 1793), and 'The Iliad' (Lond. 1795), and his illustrations of Dante and Æschylus. Many of his works display wonderful grandeur of composition, and a pure and noble style. He was one of the first of those who, following the example of Winckelmann, strove to penetrate to the true spirit of antique art, in opposition to the false taste of the time. The study of vase-paintings, and of the Pompeian mural pictures, then just revived, led him to abandon the sickly mannerism of his predecessors for the severe simplicity of the antique, and he may with justice be styled the author of modern *rilievo* (see ALTO-RILIEVO). His works are not, however, all of equal value, and, in general, it may be said that his skill in modelling was not equal to his inventive genius. The poetry of his conceptions is of a high order. F. contributed much towards bringing the outline style, now so popular, into general use. Of his sculptures, the best known in England are his bas-relief monument to the poet Collins at Chichester, the monument to Lord Mansfield, and that to the Baring family at Micheldean Church, in Hampshire. His model for the shield of Achilles, taken from the 18th book of the *Iliad*, is particularly worthy of admiration. F.'s private collection is now in University College, London, in the gallery known as *Flaxman Hall.*

FLEA (*Pulex*), a Linnæan genus of apterous insects, now commonly regarded by entomologists as constituting a distinct order, *Suctoria*, *Siphonaptera*, or *Aphaniptera*. The species are not numerous, and little subdivision of the genus has been attempted. It has been suggested as probable, that further investigation may lead to a recognition of the fleas as belonging to some of the larger orders, with parts modified to suit their parasitical life. All the species are very similar to the COMMON FLEA (*P. irritans*), which is plentiful in all parts of the world, living by sucking the blood of man, and of some species of quadrupeds and birds. It abounds particularly in the nests of poultry, pigeons, and swallows, and wherever sand and dust accumulate in the chinks of floors, &c; it is to be found also plentifully in beds, wherever cleanliness is neglected. The abundance of fleas in some countries is an intolerable nuisance to travellers, and also to residents. Such is said to be particularly the case in many parts of Australia, where the general dryness and warmth encourage their growth to an extent against which the precautionary measures of housewives are almost entirely unavailing. The female flea is rather larger than the male, but the sexes are otherwise very similar. The head is small, very compressed, rounded above, and has on each side a small round eye. The mouth has two lancet-like mandibles, the maxillæ being represented by two conical scales, the mandibles and maxillæ forming a suctorial beak, with a slender bristle-like tongue, the whole enclosed between two three-jointed plates. The thorax consists of three segments, the second and third of which bear a scale on each side; the scales are regarded as rudimentary wings. There is no marked division between the thorax and the abdomen, which consists of nine segments, much larger than those of the thorax, but much compressed. The whole body is covered with a tough integument. The activity of the flea, its power of leaping, and its extraordinary strength, are well known. Its strength has sometimes been applied to the drawing of miniature carriages, cannon, &c., which the public have been invited to witness through a magnifying-glass, as an amusing spectacle. Fleas undergo a complete metamorphosis. The female lays about a dozen eggs of a white colour, and slightly viscous. The larva is a lively little worm, at first white, afterwards reddish, and destitute of feet. When about to change into a pupa, it encloses itself in a little silk cocoon, from which emerges the perfect flea. Cleanliness and careful attention are the principal means of keeping beds and houses free of fleas; but where these are found insufficient, as is apt to be the case in some climates, and in cottages where there is much wood-work with gaping joints, certain strongly aromatic plants are employed, of which the odours appear to be detestable to them, as the different *Compositæ* known by the name of fleabane, and also wormwood, the merits of which last are thus extolled by Tusser:

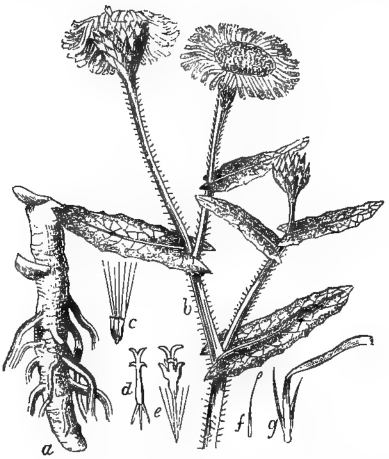
> 'While wormwood hath seed, get a handfull or twaine,
> To save against March, to make flea to refraine;
> Where chamber is sweeped, and wormwood is strown,
> No flea for his life dare abide to be known.'

Other species of fleas infest particular animals, as the dog, fox, mole, &c.—The Chigoe (q. v.), or Jigger of the West Indies, nearly allied to the true fleas, is far more troublesome than any of them.



Common Flea (*Pulex irritans*), magnified.

FLEA'BANE (*Pulicaria*), a genus of plants of the natural order *Compositæ*, sub-order *Corymbiferæ*, having hemispherical imbricated involucres and yellow flowers; the whole plant emitting a peculiar aromatic smell, sometimes compared to that of soap, which is said to be efficacious in driving away fleas.



Fleabane (*Pulicaria dysenterica*):
a, root; *b*, top of stem, with leaves and flowers; *c*, achene, with pappus; *d*, pistil; *e*, a floret of the disc; *f*, a stamen; *g*, a floret of the ray.

Two species are found in England, one of which (*P. dysenterica*), common in moist places, with oblong leaves, stem 12—15 inches high, cottony, and bearing panicled flowers, has a considerable reputation in diarrhœa and dysentery. The Russian soldiers, in the expedition to Persia under General Keith, were much troubled with dysentery, which was cured by this plant.—*Conyza squarrosa*, also called fleabane, belongs to a nearly allied genius.

FLECHE, LA, a town of France, in the department of Sarthe, is agreeably situated on the right bank of the Loir, 24 miles south-south-west of Le Mans. It is a well-built town, and has three principal streets, which are wide and well paved. Its principal building is the military school, with a library of 15,000 volumes, destined for the education of the sons of poor officers, or of soldiers who have highly distinguished themselves. The building now occupied by the school was once a royal palace, and was built by Henry IV. It was subsequently given by him to the Jesuits, and used by them as a Jesuit college. Here Prince Eugene, Descartes, and Picard the astronomer, were educated. F. has some trade in corn, hay, and wine, also manufactures of linen, hosiery, and gloves. Pop. 7150.

FLE'CKNOE, RICHARD, the date of whose birth is unknown, is said to have been an Irish Roman

Catholic priest. He came to London, mingled in the wars of the wits, and wrote several plays, all of which are now forgotten. He died in 1678. F. came under the lash of Dryden, whose satire, entitled *Mac Flecnoe*, is partly the model of Pope's *Dunciad* (q. v.), and will be remembered as long as the great satirist is remembered. From those who are acquainted with our extinct literature, we have the assurance that F. has been hardly dealt with; that though he did not rise to the rank of Dryden as a poet, he was the author of several fugitive pieces, not without grace, fancy, and happy turns of expression. Among his dramatic pieces are *Ermina, or the Chaste Lady; Love's Dominion* (printed in 1654, and dedicated to Cromwell's favourite daughter, Mrs Claypole); and *The Marriage of Oceanus and Britannia.* His *Miscellanea, or Poems of all Sorts*, appeared in 1653.

FLEET (that which floats), a collection of ships, whether of war or commerce, for one object or for one destination. The diminutives of fleet are 'division' and 'squadron.' In the royal navy, a fleet is ordinarily the command of an admiral or vice-admiral.

FLEET MARRIAGES. The practice of contracting clandestine marriages was very prevalent in England before the passing of the first marriage act (see MARRIAGE). The chapels at the Savoy and at May Fair, in London, were long famous for the performance of these marriages; but no other place was equal in notoriety for this infamous traffic to the Fleet Prison. It must be observed, that before the passing of the 26 Geo. II. c. 33, there was no necessity in England for any religious ceremonial in the performance of marriage, which might be contracted by mere verbal consent. Hence it was not in virtue of any special privilege existing within the liberty of the Fleet that marriages at that place became so common; but rather from the fact, that the persons by whom they were performed, having nothing to lose either in money or character, were able to set at defiance the penalties enacted from time to time with a view to restrain this public nuisance. The period during which these marriages were in greatest repute was from 1674 to 1754. The first notice of a Fleet marriage is in 1613, in a letter from Alderman Lowe to Lady Hickes, and the first entry in a register is in 1674. Up to this time, it does not appear that the marriages contracted at the Fleet were clandestine; but in the latter year, an order having been issued by the ecclesiastical commissioners against the performance of clandestine marriages in the Savoy and May Fair, the Fleet at once became the favourite resort for those who desired to effect a secret marriage. At first, the ceremony was performed in the chapel in the Fleet; but the applications became so frequent, that a regular trade speedily sprung up. By 10 Anne, c. 19, s. 176, marriages in chapels without banns were prohibited under certain penalties, and from this time, rooms were fitted up in the taverns and the houses of the Fleet parsons, for the purpose of performing the ceremony. The persons who celebrated these marriages were clergymen of the Church of England, who had been consigned for debt to the prison of the Fleet. These men, having lost all sense of their holy calling, employed touters to bring to them such persons as required their office. The sums paid for a marriage varied according to the rank of the parties, from half-a-crown to a large fee where the liberality and the purse combined to afford a large reward. During the time that this iniquitous traffic was at its height, every species of enormity was practised. Young ladies were compelled to marry against their will; young men were decoyed into a union with the most infamous characters; and persons in shoals resorted to the parsons to be united in bonds which they had no intention should bind them, and which were speedily broken to be contracted with some new favourite. The sailors from the neighbouring docks were steady patrons of this mode: it was stated by the keeper of one of the taverns, that often, when the fleet was in, two or three hundred marriages were contracted in a week. Persons of a more respectable character also at times resorted to the Fleet. Thus the Hon. Henry Fox was here married to Georgina Caroline, daughter of the second Duke of Richmond. Pennant thus describes the neighbourhood of the Fleet in his time: 'In walking along the street in my youth, on the side next the prison, I have often been tempted by the question: "Sir, will you be pleased to walk in and be married?" Along this most lawless space was hung up the frequent sign of a male and female hand conjoined, with "marriages performed within" written beneath. A dirty fellow invited you in. The parson was seen walking before his shop, a squalid, dirty figure, clad in a tattered plaid night-gown, with a fiery face, and ready to couple you for a dram of gin or a pipe of tobacco.' —*London*, p. 193. Registers of these marriages were kept by the various parties who officiated. A collection of these books, purchased by government in 1821, and deposited in the Consistory Court of London, amounted to the incredible number of between two and three hundred large registers, and upwards of one thousand smaller books, called pocket-books. These registers were not received as evidence in a court of law (*Doe d Davies v. Gatacre*, 8 Carr. and P. 578), not because the marriage was invalid, but because the parties engaged in the ceremony were so worthless that they were deemed undeserving of credit. Various attempts were made to stop this practice by acts of parliament. By 6 and 7 Will. III. c. 52, and again by 7 and 8 Will. III. c. 35, penalties were imposed on clergymen celebrating any marriage without banns; but these provisions were without effect upon men who had nothing to lose. At length, the nuisance became intolerable, for, owing to the difficulty of proving these marriages, respectable parties, who in folly had entered into them, found it often impossible to establish their marriage, and the greatest confusion was in consequence produced. The act of the 26th Geo. II. c. 33, was therefore passed, which struck at the root of the matter by declaring that all marriages, except in Scotland, solemnised otherwise than in a church or public chapel, where banns have been published, unless by special licence, should be utterly void. This act met with strenuous opposition in the House of Commons, especially by Mr Fox, who had been himself married in the Fleet, but ultimately it was passed into a law. The public, however, were unwilling to surrender their privilege, and on the 26th March 1754, the day before the act came into operation, there were no less than 217 marriages entered in one register alone. See Burn's *History of Fleet Marriages*, to which we are indebted for many of the above particulars.

FLEET PRISON, a celebrated London jail, which stood on the east side of Farringdon Street, on what was formerly called Fleet Market. The keeper of it was called the Warden of the Fleet. It derived its name from the Fleet rivulet, so named from its rapidity, which flowed into the Thames. By the Act 5 and 6 Victoria, the Fleet Prison and the Marshalsea were abolished, and their functions transferred to the Queen's Bench, under the new name of the Queen's Prison. The Fleet was the king's prison so far back as the 12th c., and a receptacle for debtors since about the same period. The followers of Wat Tyler burned it in the reign of Richard II. In the 16th and 17th centuries, it acquired a high historical interest from its having been the prison of the religious martyrs of the reigns of Mary and Elizabeth, and of the political victims of the Courts of the Star Chamber and High Commission in that of Charles I. On the abolition of the Star Chamber in 1641, it became a place of confinement for debtors and persons committed for contempt from the Courts of Chancery, Exchequer, and Common Pleas. During the 18th c., it was the scene of every kind of atrocity and brutality, from the extortion of the keepers and the custom of the warden underletting it. The Fleet was several times rebuilt; the last building was erected after the burning of the older one in the Gordon riots of 1780, the predecessor of which had been destroyed in the great fire of London in 1666. Latterly, it usually contained 250 prisoners, and kept ward of about 60 outdoor *detenus* for debt, privileged to live within the rules.

FLEE'TWOOD, or **FLEETWOOD-ON-WYRE**, a small but thriving town, seaport, and military station of England, in the county of Lancashire, is situated on a promontory at the mouth of the estuary of the Wyre, about 20 miles south-west from Lancaster. It is a modern town, and owes its origin and importance to its facilities for railway and steam-vessel communication. It is handsomely laid out, has an excellent harbour, and is a favourite resort for sea-bathing. A government school of musketry, which promises to be for the north of England what Hythe and Aldershott are for the south, is now in full operation here. It has a staff of instructors, and quarters for 300 men and 60 officers; besides a substantial hut-encampment, about a mile from the town, for 200 men and 14 officers, where there are quarters for married soldiers, hospital, lecture-rooms, &c., and a large tract of land for rifle practice. In 1860, 1907 vessels, of 365,562 tons, entered and cleared the port. Pop. (1861) 3831.

FLE'MISH LANGUAGE AND LITERATURE. The Vlaemisch or Flemish is a form of Low German still spoken in the Belgian provinces of East and West Flanders, Limburg, Antwerp, North Brabant, and in some parts of Holland and the Walloon provinces of Belgium. So little change has taken place in this dialect, that the form of speech in which the Council of Liptines drew up (in 742) the creed, in which pagans were made to express their renunciation of idolatry on being converted to Christianity, requires only the alteration of a few letters to make it intelligible to a modern Fleming. Flemish has much affinity with the Frisian, and constitutes, together with modern Dutch (which was originally identical with it, and now only differs from it in a few orthographical and otherwise unessential particulars), the national tongue of the whole of the Low Countries. The most ancient record of Flemish, is a fragment of a translation in prose of the Psalms a thousand years old. In the 13th c., public deeds began to be drawn up in the vernacular, which are perfectly intelligible in the present day (as the Ordinance of Henry I. of Brabant, 1229, in the *Brussels Book of Privileges*). In the same century, J. van Maerlant, the 'father of Flemish poets,' author of *The Historical Mirror*, *Wapen Martin*, *Rymbibel*, &c., and W. van Utenhove composed numerous poems, and translated from the French and German, and very probably from the Latin. Willems and other critics believe that to the Flemish must be ascribed the honour of the original and entire poem of *Reinært Vos*, the first part of which they refer to the middle of the 12th c., while the second part is attributed to W. van Utenhove, and supposed to have been written about 1250. The 14th c. was remarkable for the numbers and excellence of the Flemish *Sprekkers*, *Zeggers*, and *Vinders*, or wandering poets, some of whose works have been published by Blommaert; and for the origin of the Chambers of Rhetoric, which exerted a marked influence on the progress of literature during succeeding ages, and became the arbiters of literary and dramatic fame through the Netherlands generally. In the 16th c., the French element gained ascendency, and the old Flemish lost much of its original terseness and purity. Numerous translations of the Scriptures appeared; among the most remarkable of which are the Psalms by Dathenus (1556), and by Marnix (1580), the author of the *Roomsche Biekorf* (1569). The translation of the entire Bible was not effected till 1618, when the General Synod of Dort decided to employ learned men capable of giving a correct version from the Hebrew and Greek texts; and this great work was finally completed by two Flemings, Baudaert and Walons, and two Dutchmen, Bogermann and Hommius. Strenuous efforts were also made, at this period, to give greater freedom to the Flemish language; and hence this original Flemish version of the Bible has become a standard in regard to the construction and orthography of the language. Hooft, Vondel, and Cats are the three men whose names stand foremost among the Flemish writers of the 17th century. Hooft was a poet, but he is best known by his *History of the Netherlands*, which is held in high esteem by his countrymen. Vondel, who was one of the leading men of his day, made his tragedies the vehicles of hurling the most cutting satire on every obnoxious measure of the government; and his works still maintain their ground. He had great versatility of powers; and in his latter years, his talents were directed to the exaltation of Catholicism, to which he had been converted. Cats was essentially the poet of the people; and for 200 years, his works, popularly known as the *Household Bible*, have been cherished alike among the poor and wealthy. Although Cats was a skilful lawyer, an active statesman, and a profound scholar, he found time to compose a great number of works, as the *Zorgvliet; Trouwring* (the Wedding Ring); *Houwelyck* (Marriage), which exhibit the most intimate acquaintance with the everyday-life of his countrymen. His *Moral Emblems* have recently (1859) been translated into English, and published by Messrs Longman & Co. The 18th c. was barren of poetic genius in the Low Countries, but it produced several good philologists, as Stevens, Huydecoper, and Ten Kate, the latter of whom is the author of a work on the Flemish language, which has served as a fundamental authority for modern writers. The arbitrary measures of the French government, under Napoleon, against the official use of Flemish, had the effect of crushing for a time the very spirit of nationalism, while it completely annihilated native literature; and it was not till after the revolution of 1830, that the Flemish language regained its footing in the Belgian provinces. This revival of the national form of speech is mainly due to the unremitting efforts of such writers as Willems, Bilderdijk, Cornelissen, Blommaert, Conscience, Delecourt, Ledeganck, &c., whose works have imparted fresh vigour, and greater grammatical precision to the Flemish. In 1841, on the occasion of a linguistic congress held at Ghent, the members of the government for the first time publicly recognised the existence of the Flemish element in the people, and addressed the meeting in the national dialect. The last twenty years have confirmed this movement; and while the best foreign works have been rendered into Flemish, the writings of Blommaert, Conscience (q. v.), and other native authors have been translated into many of the European tongues. See Sleecx on the *History of the Flemish, and its Relation to other Languages;* Willems (1819—1824), *Verhandl. ov. d. Nederduyt.;* O. Delepierre, *History of Flemish Literature* (1860).

FLE'MMING, Paul, one of the best German poets of the 17th c., was born October 15, 1609, at Hartenstein, in the principality of Schönburg, where his father was minister. He studied medicine at Leipsic, but was induced by the distractions of the Thirty Years' War to retire to Holstein in 1633. In the same year he accompanied the embassy sent by the Duke of Holstein to Russia, and in 1635, was attached to the more splendid embassy sent out to Persia. He returned in 1639, married, and resolved to settle as a physician in Hamburg, but died there 2d April 1640. F. stands at the head of the German lyric poets of the 17th c. His *Geistliche und weltliche Poemata* (Jena, 1642) contain many exquisite love songs, which, for more than a century, remained unequalled in finish and sweetness. Others are distinguished for enthusiasm of feeling, ardent patriotism, and manly vigour, while his sonnets are marked by strength and thorough originality. F.'s longer poems describe the adventures of his journey; occasionally at least with great spirit, though they are not free from the weaknesses of his time. His beautiful hymn, *In allen meinen Thaten*, composed before his journey to Persia, proves his genius as a writer of sacred songs. His life, with his select poems, was published by Schwab (Stuttgard, 1820). Compare Knapp, *Evangelischer Liederschatz* (Stuttg. 1837), and Müller in the *Bibliothek Deutscher Dichter des 17 Jahrhundert* (3 vols., Leipsic, 1822); and Varnhagen von Ense, in the 4th vol. of the *Biographische Denkmale.*

FLE'NSBORG, the most populous and considerable town in the duchy of Slesvig, at the extremity of the Flensborg Fjord, an inlet of the Baltic, and 19 miles north of the town of Slesvig. Pop. 18,872. It is the capital of a bailiwick of the same name, which included the north part of the district supposed to have been the country of the Angels, or Angli. F. is said to have been founded in the 12th c., and named from its founder, the Knight Flenes. In 1284 it received municipal rights from King Valdemar. F. is pleasantly situated, and has a good harbour. It has sugar refineries and distilleries, and manufactures of cloth, paper, soap, and tiles of superior quality. The trade is considerable. F. owns between 200 and 300 ships, many of which are built in its own yards. A railway, 43 miles long, connects F. with Tonningen on the Eyder.

FLERS, a town of France, in the department of Orne, north of France, 35 miles west-north-west of Alençon. It has an old castle, which was burned down in the Chouan war, but which has been recently restored. F. has considerable manufactures of linen, fustian, and especially of ticking. Pop. 5843.

FLESH is the ordinary term for muscular tissue. After the removal of the blood-vessels, nerves, connective (or cellular) tissue, &c., the flesh is found to consist of various textural elements, which are described in the article Muscle (q. v.). Numerous analyses have been made of the muscular substance of various animals. In Dr Day's translation of Simon's *Animal Chemistry*, published by the Sydenham Society, there are analyses of the flesh of man, the ox, calf, pig, roe, pigeon, fowl, carp, and trout. The following table gives the determinations of the individual constituents of the flesh of oxen, or, in ordinary language, of beef freed, as far as possible, from blood-vessels, &c., and may be regarded as fairly representing the composition of flesh generally.

			Per cent.		Per cent.
Water	varies	from	74·0	to	80·0
Solid constituents	vary	"	26·0	"	20·0
			100·0		100·0
The latter being made up of					
Muscular fibre which	varies	from	15·40	"	17·70
Gelatigenous substance	"	"	0·60	"	1·90
Albumen	"	"	2·20	"	3·00
Creatine	"	"	0·07	"	0·14
Creatinine			undetermined.		
Inosic acid			do.		
Fat	"	"	1·50	to	2·30
Lactic acid ($C_6H_5O^5,HO$)	"	"	0·60	"	0·68
Phosphoric acid	"	"	0·66	"	0·70
Potash	"	"	0·50	"	0·54
Soda	"	"	0·07	"	0·09
Chloride of sodium	"	"	0·04	"	0·09
Lime	"	"	0·02	"	0·03
Magnesia	"	"	0·04	"	0·08

Long as the above list of substances is, it does not include all the ingredients of flesh. In the freshly expressed muscular juice, which exhibits a strong acid reaction (from free lactic acid, and from acid phosphates of the alkalies), we also find small quantities of Sarcine or Hypoxanthine (q. v.), and of formic, butyric, and acetic acids—which may, however, be mere products of decomposition; very minute quantities of uric acid, and sometimes a trace of urea, which, however, occurs in very appreciable quantity in the muscles of persons who have died of cholera, and in very considerable quantity in the flesh of the plagiostomous fishes, while in other fishes not a trace of it can be detected—an apparent anomaly to which at present we see no clue; and in the juice of the heart of mammals, and in smaller quantity in their other muscles, a kind of sugar termed Inosite (q. v.). Bernard has recently discovered Glycogen (q. v.) in the muscles of the embryos of various animals.

In regard to the inorganic constituents of the juice of flesh, Liebig directs especial attention to the fact, that this fluid 'in all animals is particularly rich in potash, and that it also contains chloride of potassium, with only traces of chloride of sodium; while in the blood only proportionally small quantities of the salts of potash and preponderating quantities of the salts of soda and of common salt, are present.' He further notices the constant excess of the phosphates over the chlorides, and of the phosphate of lime over that of magnesia in the former fluid, as points of physiological importance. The value of these investigations will be shewn in the article Metamorphosis of Tissue (q. v.).

It is worthy of notice, in connection both with physiology and dietetics, that the dried flesh of the ox is identical in its ultimate composition with dried blood, as is shewn by the following analyses, which were made by Professor Lyon Playfair:

	Beef.	Ox-blood.
Carbon, . .	51·83	51·95
Hydrogen, . .	7·57	7·17
Nitrogen, . .	15·01	15·07
Oxygen, . . .	21·37	21·39
Ashes, . . .	4·23	4·42

This analysis singularly confirms the statement made previously by an eminent French physiologist, that in so far as ultimate organic composition is concerned, 'the blood is liquid flesh.'—For further information on the subject, we may refer to Liebig's *Researches on the Chemistry of Food*, translated by Gregory, and Lehmann's *Physiological Chemistry*, vol. iii.

FLESH-FLY, or **BLUE-BOTTLE-FLY** (*Musca vomitoria*), an insect of the same genus with the common House-fly (q. v.), which it much exceeds in size, although it is not equal in size to the

Blow-fly (q. v.). The forehead is rust-coloured, the thorax grayish, the abdomen blue with three black bands. The expanse of wings is nearly one inch. It is abundant throughout Britain and Europe generally, and deposits its eggs on flesh, for which purpose it often enters houses, having a remarkably delicate sense of smelling. The maggots are of very frequent occurrence on meat in summer, notwithstanding all care that can be taken.—A nearly allied species (*M. Cæsar*) is distinguished by its golden green colour, and is also common in Britain. It is found in houses from the beginning of spring to the end of autumn. Another (*M. lardaria*), with silky tawny face, a black stripe on the crown, thorax glittering white with four black stripes, and abdomen bluish-gray, tesselated with black, is most common in the end of autumn, frequenting bushes of ivy and late flowers, and is also a pest of the larder.

FLE'TA, the title of a valuable treatise on the law of England. It is not known by whom this treatise, which is one of the earliest authorities on English law, was written, and it derives its title from the circumstance that it was written in the Fleet prison. Lord Campbell remarks—*Lives of the Chancellors*, i. 166 and note: 'I shall rejoice if I do tardy justice to the memory of Robert Burnel, decidedly the first in this class, and if I attract notice to his successors, who walked in his footsteps. To them, too, we are probably indebted for the treatises entitled *Fleta* and *Britton*, which are said to have been written at the request of the king, and which, though inferior in style and arrangement to Bracton, are wonderful performances for such an age. *Fleta* must have been written after the 13th year of the king (Edward I.), and not much later; for it frequently quotes the statute of Westminster the second, without referring to the later statutes of the reign.

FLETCHER, Andrew, of Salton, a celebrated Scottish patriot and politician, was the son of Sir Robert Fletcher and Catherine Bruce, daughter of Sir Henry Bruce of Clackmannan. He was born in 1653. Notwithstanding the strong anti-English feelings which characterised him through life, F. was of English descent by the father's side; his father being the fifth in the direct line from Sir Bernard Fletcher of the county of York. But his mother was of the royal House of Scotland, the first of the Clackmannan family having been the third son of the Lord of Annandale, Robert de Bruce, who was the grandfather of the great King Robert. F.'s father, who died in his childhood, consigned him to the care of Gilbert Burnet, then minister of Salton, afterwards the well-known Bishop of Salisbury; by whom he was instructed not only in literature and religion, but in those principles of free government of which he afterwards became so zealous an advocate. So early as 1681, when he sat in parliament for the first time as commissioner for East Lothian, F. offered so determined an opposition to the measures of the Duke of York (afterwards James II.), then acting as the Royal Commissioner in Scotland, that he found it necessary to retire, first into England, and then into Holland. He there entered into close alliance with the English refugees, who had assembled in considerable numbers; and on his return to England in 1683, he shared the counsels of the party of which Russell, Essex, Howard, Algernon Sydney, and John Hampden (the grandson of the still more famous patriot of the same name) were the leaders. Though usually regarded as a republican, F.'s political creed, like that of Algernon Sydney, approached far nearer to aristocracy than to democracy in the modern sense; for though he was disposed to restrict the monarchical element of the constitution within the narrowest limits, if not to abolish it altogether, he was so far from being an advocate for a universal participation in political rights, that one of his favourite schemes for the reformation of the hosts of vagrants and paupers by whom Scotland was infested in his day, consisted in the establishment of slavery in the form in which it had existed in the classical nations of antiquity. On the discovery of the Rye House plot, F. returned to Holland. His next visit to England was as a volunteer under the unfortunate Duke of Monmouth in 1685; but he was compelled to leave the insurgent army, at the beginning of the enterprise, in consequence of his having shot the mayor of Lynn, with whom he had had a personal quarrel about a horse. The next hiding-place which F. selected was Spain; but he had no sooner arrived, than he was thrown into prison at the instance of the English ambassador, and would have been transmitted to England, to share the fate of his fellow-patriots, had he not been mysteriously delivered from prison by an unknown friend. From Spain he proceeded to Hungary, where he entered the army as a volunteer, and greatly distinguished himself. He returned to England at the Revolution. A few years later, he met in London, accidentally, it should seem, the famous William Paterson, the founder of the Bank of England, and the projector of the Darien Expedition in London; and it was at F.'s solicitation that Paterson came to Scotland, and offered, to the acceptance of his countrymen, a project which he had originally intended should be carried out by the far greater resources either of the trading communities of the Hanse towns, or of the princes of the German empire. The bitterness caused by the treatment which the Darien colonists received at the hands of King William's government, tended to confirm F. and his friends in their opposition to the Union with England, and led to his delivering in parliament those spirited harangues in favour of an exclusive Scottish nationality, which still stir the blood of his countrymen. After the Union, he retired in disgust from public life, and died in London in 1716. F.'s writings originally appeared in the form of tracts, and anonymously; they were, however, collected and reprinted at London in 1737, under the title of *The Political Works of Andrew Fletcher, Esquire.*

FLETCHER, Giles and Phineas, were the sons of Dr Giles Fletcher, Queen Elizabeth's ambassador to the court of Russia, and cousins to Fletcher the dramatist.

Giles, the elder, was born about 1580; he was educated at Cambridge, and died at his living at Alderton in 1623. His chief poetical work is a sacred poem, entitled *Christ's Victory and Triumph*, which appeared at Cambridge in 1610. This poem, although once admired, is now unknown to general readers, and is chiefly remarkable for having, to some extent, moulded the majestic muse of Milton.

Phineas, the younger brother of Giles, was born about 1584, educated at Eton and Cambridge, and became rector of Hilgay, in Norfolk, in 1621, and died there in 1660. His most important poem, the *Purple Island, or the Isle of Man*, was published in 1633. It contains an elaborate description of the human body and mind—the former being given with great anatomical minuteness. The mind is represented as being beleaguered with the vices, and likely to be subdued, when an angel comes to the rescue—the angel being James I. Although to a large extent formal and pedantic, the *Purple Island* abounds in fine passages, in which the lusciousness of Spenser and the gravity of Milton are curiously mingled.

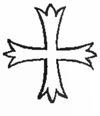
FLETCHER, John. See Beaumont and Fletcher.

FLEUR-DE-LIS. Authorities are divided as to whether this celebrated emblem is derived from the white lily of the garden, or from the flag or iris, which, as generally represented, it more resembles both in form and colour. 'Ancient heralds,' says Newton (*Display*, p. 145), 'tell us that the Franks of old had a custom, at the proclamation of their king, to elevate him upon a shield or target, and place in his hand a reed or flag in blossom, instead of a sceptre; and from thence the kings of the first and second race in France are represented with sceptres in their hands like the flag with its flower, and which flowers became the armorial figures of France.' However this may be, or whatever may be the value of the other legendary tales, such as that a blue banner, embroidered with golden fleurs-de-lis, came down from heaven; that an angel gave it to King Clovis at his baptism, and the like; there can be little doubt that, from Clovis downwards, the kings of France bore as their arms first an indefinite number, and latterly three golden lilies on a blue field, or, as heralds would say, azure, three fleurs-de-lis, Or—It was Charles VI. who reduced what had hitherto been the indefinite number of fleurs-de-lis to three, disposed two and one; 'some conjecture upon account of the Trinity, others say, to represent the three different races of the kings of France.'—Nisbet, i. 383. Many English and Scotch families bear the fleur-de-lis in some portion of their shield, and generally with some reference to France.

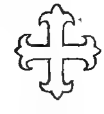
Fleur-de-Lis.

FLEURUS, a small town of Belgium, in the province of Hainault, is situated north of the left bank of the Sambre, and 15 miles west of Namur: pop. about 2200. It has been the scene of several contests, the last and most important, however, being the battle of F., fought here 26th June 1794, between the army of the French Republic, consisting of 89,000 troops, under Jourdan, and the allies, who were inferior in numerical strength, under the Prince of Saxe-Coburg. The latter leader gave orders for a retreat at the very moment when a resolute advance might have decided the victory in his favour, and the result was, that Jourdan was enabled to unite his army with those of the Moselle, the Ardennes, and the North, and that the allied forces were compelled for a time to evacuate Flanders.

FLEURY, FLORY, FLOWRY, FLEURETTE, &c., in heraldry, signifies that the object is adorned with fleurs-de-lis; a cross-fleury, for example, is a cross, the ends of which are in the form of fleurs-de-lis. There are several varieties in the modes of representing these crosses, which has led to distinctions being made between them by heralds too trivial to be mentioned: but they are all distinguishable from the cross-potance, or potancée, incorrectly spelled patonce by English heralds. (Mackenzie's *Science of Heraldry*, p. 44). In the latter, the limbs are in the form of the segments of a circle, and the foliation is a mere bud; whereas the cross-fleury has the limbs straight and the terminations distinctly floriated. Thus—



Cross-potance.



Cross-fleury.

Perhaps, the most celebrated instance of this bearing, is in the case of the double prepuce flowery and counter-flowery gules which surrounds the red lion in the royal arms of Scotland, and which Charlemagne is said to have conferred on Achaius, king of Scotland, for assistance in his wars. The object, according to Nisbet (ii. 101), was to shew that, as the lion had defended the lilies of France, these 'hereafter shall continue a defence for the Scots lion, and as a badge of friendship, which has still continued.' That the lilies were assumed in consequence of the intimate relation which prevailed between France and Scotland for so many generations, will not be doubted; but the special occasion of the assumption may not be admitted in our day to be quite beyond the reach of scepticism, notwithstanding Nisbet's assertion that it is so fully instructed by ancient and modern writers that he need not trouble his readers with a long catalogue of them.

FLEURY, Claude, a French church historian, was born at Paris, 6th December 1640, and was educated at first for the law, but preferring an ecclesiastical career, subsequently took priest's orders. In 1672, he became tutor to the young Prince de Conti, who was brought up along with the dauphin, and at a later period, to the Comte de Vermandois, natural son of Louis XIV. After the death of the Comte in 1683, the French monarch appointed him, under Fenelon, tutor to the Princes of Burgundy, Anjou and Berri, and also abbot of the Cistercian monastery of Loc-Dieu. When the princes had completed their education, F. was rewarded with the priorate of Argenteuil. The Duke of Orleans selected him for confessor to the young king, Louis XV., giving as his reason for so doing, that F. was neither Jansenist, nor Molinist, nor Ultramontanist, but Catholic. F. held this office till 1722, when the infirmities of age compelled him to resign it. He died 14th July 1723. F. was as learned as he was modest, and as mild and kind-hearted as he was simple in his manners, and upright in his conduct. Among his numerous works may be mentioned, *Mœurs des Israélites* (Paris, 1681); *Mœurs des Chrétiens* (Paris, 1662); *Traité du Choix et de la Methode des Etudes* (Paris, 1686); *Institution au Droit Ecclesiastique* (1687); and, above all, the *Histoire Ecclesiastique* (20 vols., Paris, 1691—1720). On this work, F. laboured thirty years. It is marked by great learning, and, on the whole, by a judiciously critical spirit. What may be called his professional sympathies, are held in check by a noble desire to be impartial, which might well put to the blush the unveracious partisanship of many Protestant writers. Semler (q. v.), an eminent German theological professor, avowed that his lectures were at first mainly extracts from the *Histoire Ecclesiastique*. Even Voltaire praised it. 'The history of F.,' says he, 'is the best that has ever been executed.' D'Alembert, and many others, recommend F.'s style as a model of elegant simplicity. The so-called *Abrégé de l'histoire Ecclesiastique de Fleury*, published at Berne in 1776, is ascribed to Frederic the Great. A posthumous work of F.'s, entitled *Discours sur les libertés de l'Eglise Gallicane*, has always been very popular.

FLE'XURE, or **FLEXION,** is the bending or curving of a line or figure (see Curvature). A curve is said to have a point of *contrary* flexure at the point where it changes its character of concavity or convexity towards a given line. In the art of building, flexure denotes the bending of loaded beams. If a beam, supported at its two ends, be loaded, it bends, its lower surface becoming convex, and its upper concave. In this bending, the particles in the lower surface are drawn away from each other, and those in the upper are more closely packed together, while between the surfaces there is a line called *the line of no disturbance*, wherein the particles are neither drawn asunder nor compressed, and from which the mathematical theory of the flexure of beams starts. Experiments shew that the flexure of solid beams, supported at their ends, and loaded, varies—(1.) directly as the load; (2.) inversely as the product of their *breadths*, and the cube of their *depths;* and (3.) directly as the cube of the distance between the supports, while the flexure, if the load be uniformly distributed over the beam, is ⅝ths of the amount produced by the load placed on its centre. See STRENGTH OF MATERIALS.

FLIES, SPANISH OR BLISTERING. See CANTHARIS.

FLINDERS, MATTHEW, an adventurous English navigator, to whom we are indebted for a correct knowledge of a great portion of the Australian coasts, was born at Donington, in Lincolnshire, 1760. He entered the merchant service at an early age, and subsequently the royal navy. In 1795, the vessel in which he was midshipman conveyed the governor of New Holland to Botany Bay; and while there, F. determined to investigate the coast south of Port Jackson, about 250 leagues of which were laid down in the charts as 'unknown.' With an equally daring and ambitious young surgeon in his ship, called Bass, he departed on the enterprise in a small decked vessel, with a crew of only six men. Their chief discovery was the straits between Van Diemen's Land (now Tasmania) and the mainland of Australia, which were named after Bass. In 1801, F. obtained from the British government the command of a scientific expedition for the investigation of the Australian coasts and their products. Commencing his examination at Cape Leuwin, F., in the course of two years, gradually explored the coast to Bass's Straits, thence northwards—laying down carefully the Great Barrier Reefs—to the Gulf of Carpentaria, which he thoroughly surveyed across to Timur, then back to Cape Leuwin, and round the south coast to Port Jackson. In 1810 he was liberated from a six years' imprisonment by the French in the Isle of France, returned to England, and gave the world the result of his researches in a work, entitled *A Voyage to Terra Australia.* He died in July 1814, the day on which his book was published.

FLINDERS LAND, now South Australia (q. v.).

FLINDE'RSIA, a genus of trees of the natural order *Cedrelaceæ*, one species of which, *F. australis*, yields timber little inferior to mahogany. It is much used in Australia, and is there called CALLCEDRA WOOD.

FLINT, a mineral which may be regarded as a variety of quartz, or as intermediate between quartz and opal, consisting almost entirely of silica, with a very little lime, oxide of iron, water, carbon, and sometimes even traces of organic matter. It has a flat shell-like fracture, is translucent or semi-transparent, and varies in colour from a very dark brown, or almost black, to light brown, red, yellow, and grayish white, and is sometimes veined, clouded, marbled, or spotted. Dark-coloured flints are most common in the chalk, in which principally F. occurs imbedded, forming nodules of various sizes, sometimes large nodular masses, of irregular and often grotesque shape; but gravel formed of light-coloured flints is very common, and it is disputed whether or not a change of colour has taken place by exposure to atmospheric and other chemical agencies. F. is sometimes found in beds or veins. It is very abundant wherever the chalk formation extends, in England and other countries; rolled F. nodules are also often found in compound rocks, and in alluvial soils; vast alluvial tracts being sometimes full of them. F. geodes often contain crystals of quartz. F. nodules are usually moist in the interior if broken when newly taken from their beds.

F. is sometimes harder than quartz, sufficiently so to scratch it. The readiness with which it strikes fire with steel is well known, and it would seem that the sparks are not all merely incandescent particles, heated by the friction, but that in some of them a chemical combination of silica and iron takes place, causing great increase of heat. The use of the F. and steel for igniting tinder, once so common, has been almost superseded by that of lucifer-matches, and gun-flints have given place to percussion-caps. According to Pliny, Clias was the first who struck fire with flint; or more probably, he was the first to shew its application to useful purposes; and he therefore received the name *Pyrodes.* The most ancient use of F. was probably for sharp weapons and cutting instruments; and F. knives, axes, arrow-heads, &c., are among the most interesting relics of rude antiquity.

At present, a principal use of F. is in the manufacture of fine earthenware, into the composition of which it enters, being for this purpose first calcined, then thrown into cold water, and afterwards powdered.

The origin of F. is a subject of considerable difficulty. Silicious deposits are sometimes a purely chemical operation, as in the case of the silicious sinter formed round the geysers of Iceland, from the evaporation of water largely charged with silex. But at the bottom of the sea, as no evaporation could take place, some other agent than springs of water saturated with silex must have supplied the materials. It is a fact of considerable importance in this inquiry, that almost all large masses of limestone have thin silicious concretions, or flints. Thus, chert is found in carboniferous and other limestones, and menilite in the tertiary limestones of the Paris basin. The conditions necessary for the deposition of calcareous strata seem to be those required for the formation of silicious concretions. The materials of both exist in solution in sea-water, and as it needed the foraminifer, the coral, and the mollusc to fix the carbonate of lime which formed the chalk deposits, so the silex was secreted by innumerable diatoms and sponges, and their remains most probably supplied the material of the flint. The discovery by Dr Bowerbank and other microscopists of the spicules of sponges and the frustules of diatoms in almost every specimen of F., has clearly shewn that F. to a large extent, if not entirely, owes its origin to these minute organisms. It is, however, difficult to account for the changes that have taken place in these materials subsequent to their deposition.

FLINT, a parliamentary borough and seaport in the east of Flintshire, North Wales, formerly the capital of the county, on the left side of the estuary of the Dee, 191 miles north-west of London by rail, and 12½ miles north-west of Chester. It forms a rectangle like a Roman camp, and is surrounded by now nearly obliterated ramparts and intrenchments. The Dee estuary is some miles wide here, but is shallow and narrow at low water. Vessels of 300 tons reach the town. The principal exports are coal and lead from mines in the vicinity, which afford the chief employment. Pop. (1861) 3540. It unites with seven other places in sending one member to parliament. Roman relics and traces of Roman lead smelting-works have been found here. On a low freestone rock in a tidal marsh are the remains of a castle, built by Henry II., and dismantled in 1647. The double tower or keep is 40 feet in diameter, and includes two concentric walls, each 6 feet thick, with an intervening gallery 8 feet broad; within, is a circle 20 feet in diameter, with four entrances. Deterioration of the channel of the Dee has made F. in a great degree a port of Chester, and here larger vessels, especially with timber, are discharged, and the cargoes floated up the Dee in smaller vessels, the timber in rafts.

FLINT, a river of Georgia, one of the United States of America, unites on its right with the Chattahoochee, at the south-west angle of the state, to form the Appalachicola, which, after a course of 100 miles, enters the Gulf of Mexico. The F. itself is about 300 miles long, being practicable for steam-boats up to Albany, about 250 miles distant from the sea.

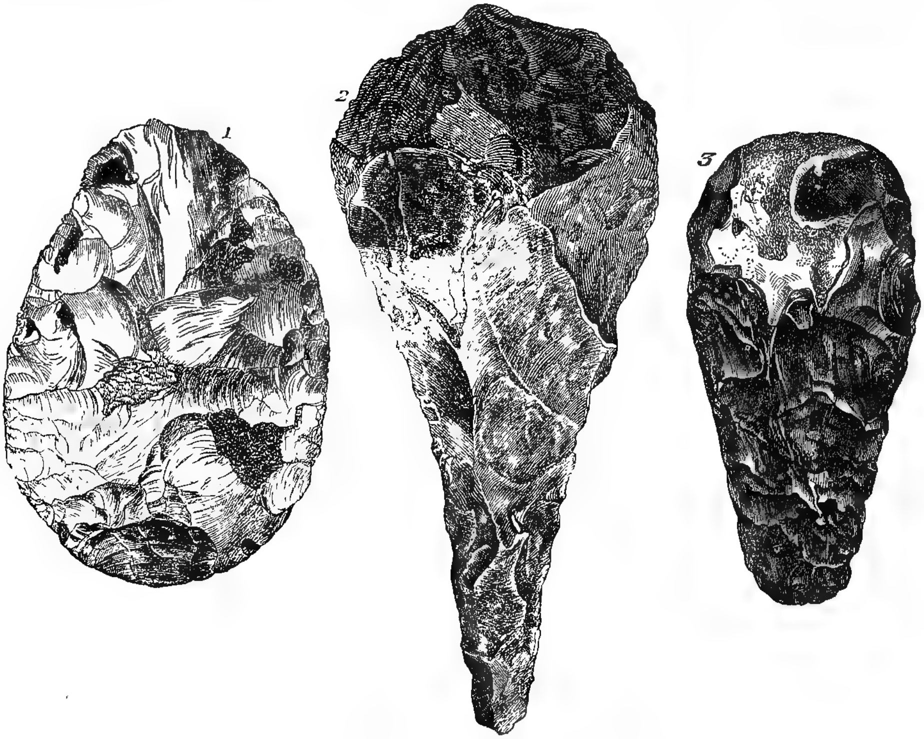
FLINT, Timothy, Rev., an American clergyman and author, was born, in 1780, at Reading, Massachusetts, and graduated at Harvard College. In 1802 he became minister of the Congregational Church in Lunenburg, county of Worcester in that state, where he remained till 1814. In the following year, he became a missionary for the valley of the Mississippi, where he was engaged in itinerant preaching and teaching a school. In 1825, he returned to the northern states; and in 1826, published his *Recollections of Ten Years passed in the Valley of the Mississippi* (Boston, 8vo). The same year appeared from his pen a novel, entitled *Francis Berrian, or the Mexican Patriot*, purporting to be the autobiography of a New England adventurer who acted a conspicuous part in the first Mexican revolution, and in the overthrow of Iturbide. In 1828, he issued two works: *A Condensed Geography and History of the Western States in the Mississippi Valley* (Cincinnati, 2 vols. 8vo); and *Arthur Clenning*, a novel (Philadelphia, 2 vols. 8vo). Another novel, *George Mason*, or *The Backwoodsman*, and a romance in 2 vols., *The Shoshonee Valley*, appeared at Cincinnati in 1830. In 1833, he edited several numbers of the *Knickerbocker Magazine*, and was subsequently editor for three years of *The Western Monthly Magazine*. His other works are: *Indian Wars in the West* (1833, 12mo); *Lectures on Natural History, Geology, Chemistry, and the Arts* (Boston, 1833, 12mo); translation of Droy's *L'Art d'être Heureuse*, with additions by translator; and *Biographical Memoir of Daniel Boone, the first Settler of Kentucky* (Cincinnati, 1834, 18mo). In 1835, he contributed to the London *Athenæum* a series of Sketches of the Literature of the United States. He died at Salem, August 16, 1840.—His son, Micah P. Flint, published a volume of poetry, entitled *The Hunter and other Poems*.

FLINT GLASS. See Glass.

FLINT IMPLEMENTS AND WEAPONS, believed to have been used by the primitive inhabitants, have from time to time, in more or less number, been turned up by the plough and the spade, dug out from ancient graves, fortifications, and dwelling-places, or fished up from the beds of lakes and rivers, in almost every country of Europe. They do not differ, in any material respect, from the flint implements and weapons still in use among uncivilised tribes in Asia, Africa, America, and the islands of the Pacific Ocean. The weapons of most frequent occurrence are arrow-heads (see Elf-arrows), spear-points, dagger-blades, and axe-heads or Celts (q. v.). The more common implements are knives, chisels, rasps, wedges, and thin curved or semicircular plates, to which the name of 'scrapers' has been given. There is great variety, as well in the size as in the shape, even of articles of the same kind. There is equal variety in the amount of skill or labour expended in their manufacture. In some instances, the flint has been roughly fashioned into something like the required form by two or three blows; in others, it has been laboriously chipped into the wished-for shape, which is often one of no little elegance. In yet another class of cases, the flint, after being duly shaped, has been ground smooth, or has even received as high a polish as could be given by a modern lapidary. Examples of all the varieties of flint weapons and implements will be found in the British Museum, in the Museum of the Royal Irish Academy at Dublin, in the Museum of the Society of Antiquaries of Scotland at Edinburgh, and above all, in the Museum of the Royal Society of Antiquaries at Copenhagen, which is especially rich in this class of remains. Representations of interesting or characteristic types may be seen in the *Catalogue of the Archæological Museum at Edinburgh in* 1856 (Edin. 1859); in Mr Wilde's *Catalogue of the Antiquities in the Museum of the Royal Irish Academy* (Dubl. 1857—1861); in Worsaae's *Nordiske Oldsager i det Kongelige Museum i Kjobenhavn* (Copen. 1859); and in M. Frederic Troyon's *Habitations Lacustres* (Lausanne, 1860).

Geological discoveries have recently invested flint implements with a new interest. At Abbeville, at Amiens, at Paris, and elsewhere on the continent, flint weapons, fashioned by the hand of man, have been found along with remains of extinct species of the elephant, the rhinoceros, and other mammals, in undisturbed beds of those deposits of sand, gravel, and clay to which geologists have given the name of 'the drift.' They so far resemble the flint implements and weapons found on the surface of the earth, but are generally of a larger size, of ruder workmanship, and less varied in shape. They have been divided into three classes—round-pointed, as in fig. 1; and sharp-pointed, as in fig. 2, both being chipped to a sharp edge, so as to cut or pierce only at the pointed end; and oval-shaped, as in fig. 3, with a cutting edge all round. The first and second classes vary in length from about four inches to eight or nine inches; the third class is generally about four or five inches long, but examples have been found of no more than two inches, and of as much as eight or nine inches. In no instance has any flint implement discovered in the drift been found either polished or ground. The French antiquary, M. Boucher de Perthes, was the first to call attention to these very interesting remains, in his *Antiquités Celtiques et Antédiluviennes* (Paris, 1847—1857). But it has since been remembered that implements of the same kind were found in a similar position at Hoxne, in Suffolk, along with remains of some gigantic animal, in 1797, and at Gray's Inn Lane, in London, along with remains of an elephant, in 1715. Both these English examples are still preserved—the first in the Museum of the Society of Antiquaries at London, the second in the British Museum, and they are precisely similar in every respect to the examples more recently found in France.

To what age these remains should be assigned, is a question on which geology seems scarcely yet prepared to speak with authority. But, in the words of Mr John Evans, in his essay on 'Flint Implements in the Drift,' in the *Archæologia*, vol. xxxviii. (Lond. 1860), 'thus much appears to be established beyond a doubt, that in a period of antiquity remote beyond any of which we have hitherto found traces, this portion of the globe was peopled by man; and that mankind has here witnessed some of those geological changes by which the so-called diluvial beds were deposited. Whether these were the result of some violent rush of waters, such as may have taken place when "the fountains of the great deep were broken up, and the windows of heaven were opened," or whether of a more gradual action, similar in character to some of those now in operation along the course of our brooks, streams, and rivers, may be matter of dispute. Under any circumstances, this great fact remains indisputable, that at Amiens, land which is now 160 feet above the sea, and 90 feet above the Somme, has, since the existence of man, been submerged under fresh water, and an aqueous deposit from 20 to 30 feet in thickness, a portion of which, at all events, must have subsided from tranquil water, has been formed upon it; and this, too, has taken place in a country the level of which is now stationary, and the face of which has been little altered since the days when the Gauls and the Romans constructed their sepulchres in the soil overlying the drift which contains these relics of a far earlier race of men.'

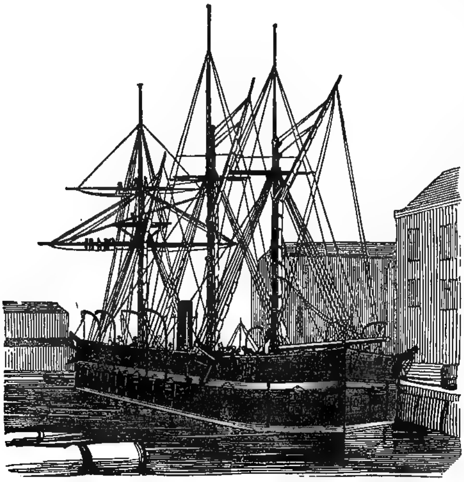


Flint Implements from the Valley of the Somme—Reduced.

FLI'NTSHIRE, a maritime county of North Wales, bounded on the E. by Cheshire and the river Dee, on the S. and W. by Denbighshire, and on the N. by the Irish Sea. The main portion of the county is 25 miles long by 10 broad, and the larger of the two outlying portions, which lies toward the south-east of the main part, is 10 miles by 5. F. is the smallest of the Welsh counties, its area being only 184,905 acres, of which $\frac{1}{7}$th is arable. The coast, 20 miles long, is low and sandy, but on the Dee estuary fertile. A hill-range, parallel to the Dee, runs through the length of the county, and rises in Garreg to 825 feet. Another range along the south-west border of the county rises in Moel Famma, 1845 feet. The chief rivers are the Dee, Alyn, and Clwyd. The chief strata are Permian, Carboniferous, and Devonian. Coal, and ores of iron, lead, silver, copper, and zinc are the chief mineral products and exports. F. supplies a fourth of the lead produced in Britain. The soil is fertile in the plains and vales, and the staple produce is wheat, oats, barley, potatoes, cattle, cheese, and butter. Cotton is the main manufacture. The London, Chester, and Holyhead Railway skirts the east and north shores. F. contains 5 hundreds and 32 parishes. Pop. (1861) 69,870. About 215 places of worship (110 Methodists, 41 Episcopal). F. sends two members to parliament. The chief towns are Flint, formerly the county town; Mold, St Asaph, Holywell, Rhyddlan, and Hawarden. F. has traces of Roman lead-mines, is traversed by Wat and Offa's Dykes, and has some ancient castle and ecclesiastical ruins. In F., in the 7th c., Saxon invaders massacred 1200 Christian monks of the monastery of Bangor. In 796, the Saxons defeated the Welsh here with dreadful slaughter, which event gave rise to the still popular plaintive air of *Morfa Rhyddlan.*

FLINTY SLATE, of which there are beds in some parts of Scotland, and in many other countries, is an impure quartz, assuming a slaty structure. It contains about 75 per cent. of silica, the remainder being lime, magnesia, oxide of iron, &c. Its fracture is rather splintery than shell-like. It is more or less translucent. It passes by insensible gradations into clay-slate, with which it is often in most intimate geological connection. Lydian Stone (q. v.) is a variety of flinty slate.

FLOA'TING BA'TTERY is a hulk, heavily armed, and made as invulnerable as possible, used in defending harbours, or in attacks on marine fortresses. The most remarkable instance of their employment was by the French and Spaniards against Gibraltar, in the memorable siege which lasted from July 1779 to February 1783, when ten of these vessels, carrying 212 large guns, were brought to bear on the fortress; they had sides of great thickness, and were covered with sloping roofs, to cause the shot striking them to glance off innocuously. But their solidity and strength were unavailing against the courage and adroitness of the defenders, under the gallant General Elliot, who succeeded in destroying them with red-hot cannon-balls. Steam floating batteries of iron were constructed for the war with Russia in 1854, both by the British and French governments; but, notwithstanding that they rendered good service before Kinburn, they have since been generally discarded for other than purely defensive purposes, as too cumbrous for navigation, and too suffocating from the smoke that collected between their decks during action.—The iron-plated frigates now (1862) made (such as the *Warrior*) can scarcely be regarded as floating batteries, being rather frigates of splendid build, rendered almost impenetrable by sheets of iron overlying their sides.



Floating Battery used in the Russian War, 1854—1855.

FLOATING ISLANDS exist in some lakes, and more rarely in slow and placid rivers. Not unfrequently, they are formed by the detachment of portions of the bank; the interlaced roots of plants forming a fabric sufficiently strong to endure the occasional buffeting of waves, and to support soil for herbage or even trees to grow in. Floating islands are often formed by aggregation of drift-wood in the creeks and bays of tropical rivers, and being wafted into the channel of the river when it is flooded or by the wind, are carried down to the sea, with the soil that has accumulated, and the vegetation that has established itself upon them. They are sometimes seen at a distance of 50 or 100 miles from the mouth of the Ganges, with living trees standing erect upon them. Portions of the alluvial soil from the deltas of rivers, held together by the roots of mangroves and other trees, are sometimes also carried out to sea after typhoons or hurricanes, and ships have, in consequence, been involved in unexpected dangers, as amongst the icebergs of colder latitudes. Imagination has always invested with a peculiar interest the

> Straggling plots, which to and froe doe rome
> In the wide waters;

and ancient legend did not fail to notice the floating islets of the sacred Vandimonian Lake, which were large enough to bear away cattle that were tempted upon them by their fresh green grass; and the island of the Cutulian waters, which carried on its surface a dark and gloomy grove, and was constantly changing its place. A small lake in Artois, near St Omer, is remarkable for the number of its floating islands, as are also the marshy lakes of Comacchio near the Gulf of Venice. Among the largest in the world are those of the Lake of Gerdau, in Prussia, which furnish pasturage for 100 head of cattle; and that of the Lake of Kolk, in Osnabruck, which is covered with beautiful elms. Loch Lomond was long celebrated for its floating island; it, however, can no longer boast of one, as it has long since subsided and become stationary. Floating islands are found in some lakes of Scotland, and also in Ireland, and consist for the most part of large floating masses of peat. Pennant gives a description of one which he saw in Breadalbane, the surface of which exhibited plenty of coarse grass, small willows, and even a little birch tree. More interesting to the scientific inquirer, as presenting a phenomenon not so easily explained, are those floating islands which from time to time appear and disappear in the same spot, of which there is one in the Lake of Derwentwater in Cumberland, one in the Lake Ralang in the province of Smalande in Sweden, and one in Ostrogothia. That in Derwentwater is opposite to the mouth of a stream called the Catgill; and the most probable of the many theories which have been proposed to account for it is that which ascribes it to the waters of the stream, when flooded by rains, getting beneath the interlaced and matted roots of the aquatic plants which there form a close turf on the bottom of the lake. This floating island, when it rises above the water, is most elevated in the centre, and on its being pierced with a fishing-rod, water has spouted up to the height of two feet.

The marshy ground of the vale of Cashmere, and particularly around the city of Cashmere, containing many lakes, and liable to inundations, exhibits a peculiar form of human industry in its numerous FLOATING GARDENS, employed chiefly for the cultivation of cucumbers, melons, and water-melons. These floating gardens may be described as portions of the marshy ground artificially made to float, by cutting through the roots of the reeds, sedges, and other plants about two feet below the surface, upon which mud is then spread. The floating of the garden secures the soil and crop from destruction by inundations.

Floating gardens existed on the Lake of Mexico before the conquest of Mexico by the Spaniards. The Mexicans had made great progress in the art of gardening, and particularly in the cultivation of flowers, which were much used both in their festivities and in their worship. How they were induced to attempt the formation of floating gardens, and at what period it was first done, are mere matters of conjecture. The shallowness of great part of the lake was favourable to the success of the attempt, and perhaps the gradual receding of its waters may be reckoned among the reasons of the gradual diminution of the number of the floating gardens, which have almost ceased to be reckoned among the wonders of the world. The Abbé Clavigero, in his *History of Mexico*, describes them as formed of wicker-work, water-plants, and mud; as sometimes more than 20 poles in extent; the largest ones commonly having a small tree in the centre, and sometimes a hut for the cultivator; and as employed for the cultivation both of flowers and culinary plants. Humboldt confirms this description, but states that the real floating gardens, or *chinampas*, are rapidly diminishing in number. The existing *chinampas* are in general not floating gardens, but plots of ground with very wide ditches between them, formed by heaping up earth from the ditches in the swamps or shallows at the side of the lake.

Great part of Bangkok, the capital of Siam, consists of floating houses. See BANGKOK.

FLOA'TSTONE, a variety of quartz, consisting of fibres—delicate crystals—aggregated so that the whole mass is sponge-like, and so light, owing to the air confined in the interstices, as to float for a while on water. It is found in a limestone of the chalk formation near Paris, in imbedded masses, or incrusting flint nodules.

FLOBE'CQ, a small town of Belgium, in the province of Hainault, 20 miles north-east of Tournai. It has extensive manufactures of linens, has breweries, salt-works, oil and flour mills, and has two fairs annually. Pop. 5258.

FLO'DDEN, BATTLE OF. On the 24th January 1502, a 'perpetual peace' was concluded between England and Scotland. In the course of a few years, however, a series of petty quarrels had done much to bring this peaceable arrangement to a termination; and in 1513, on the invasion of France, Scotland's ancient ally, by Henry of England, a war broke out between the two countries. James IV., the chivalrous but rash king of Scotland, summoned the whole array of his kingdom to meet on the Borough or Common Moor of Edinburgh, which extended from the southern walls of the city to the foot of the Braid Hills, and which was then 'a field spacious, and delightful by the shade of many stately and aged oaks.' Here an army, it is said, of 100,000 men assembled. With this force James crossed the border on the 22d August 1513; but instead of advancing at once, and achieving a decisive success, he lingered in the neighbourhood of the Tweed until his army had become reduced by desertion to about 30,000 men. On the 6th September, James took up his position on Flodden Hill, the last and lowest eminence of the Cheviots toward the north-east. On the morning of the 9th, the Earl of Surrey, lieutenant-general of the northern counties of England, at the head of an army of about 32,000 men, advanced from the south-east, crossed the Till by a skilful and unexpected movement, and thus cut off all communication between King James and Scotland. While the English were crossing the Till, the Scots might have attacked them with every chance of success, and their not taking advantage of this opportunity was the first great mistake of the battle. Observing that the English were aiming at a strong position to the north-west of Flodden Hill, and desirous of preventing this, James, having ordered his tents to be set on fire, advanced against them in battle-array. The two armies were drawn up in similar order, each consisting of a centre, a right and left wing, and a reserve placed behind the centre. At about four o'clock on Friday, 9th September, the battle commenced with cannonading on both sides. The Earls of Huntly and Home, who commanded the left wing of the Scottish army, charged the English right, which was led by Sir Edmund Howard, and entirely defeated it. Instead, however, of following up their success, Home's borderers commenced pillaging the baggage of both armies; and Huntly, after his first charge, is said to have left the field. On the Scottish right, the clansmen under Lennox and Argyle, goaded to fury by the English archers, rushed forward, heedless of order, and fell with the greatest violence upon their opponents, who, however, received them with wonderful intrepidity and coolness, and at length put them to flight with great slaughter. Meantime, a desperate resistance was being made by the Scottish centre, where the king fought on foot among his nobles. Scottish history presents no instance in which the national valour burned with a purer flame than in this. Hemmed in by outnumbering enemies, the king among his slender group of lords fought manfully until, when the night was closing on Flodden, he fell pierced by an arrow, and mortally wounded in the head. The hill was held during the night by the Scots; but at dawn, learning the state of matters, they abandoned their position. Their loss amounted to from 8000 to 10,000 men. 'Scarce a Scottish family of eminence,' says Scott, 'but had an ancestor killed at Flodden.' Besides the king, the Archbishop of St Andrews and twelve earls were among the slain. The English loss amounted to about 6000 or 7000; but Surrey's victory was so nearly a defeat that he was unable to prosecute the war with any vigour. The sixth canto of Sir Walter Scott's poem of *Marmion* contains a magnificent, and in the main an accurate, description of the battle.

FLOGGING, ARMY AND NAVY. Corporal punishment has existed from time immemorial in the British army and navy; formerly having been inflicted upon slight occasion, and often with barbarous severity. In deference, however, to public opinion, it has been much less resorted to during recent years, and promises almost to disappear under a regulation of 1860. A man must now be convicted of one disgraceful offence against discipline before he can be liable to flogging for the next such offence; and even after one such degradation, he may be restored to the non-liable class by a year's good conduct. The punishment of flogging, which is generally administered with a whip or 'cat' of nine tails on the bare back, cannot, under existing rules, exceed fifty lashes.

Corporal punishment is not recognised in the French army; but then the soldiers in that country are drawn by conscription from all ranks of society, and have, on an average, a higher moral tone than the British recruits, who, attracted by a bounty, volunteer usually from the lowest orders. On the other hand, the discipline in the French army, and especially during war on a foreign soil, is universally admitted to be inferior to the strict rule preserved among British troops. Soldiers and sailors being men unaccustomed to control their passions, and any breach of insubordination being fatal to the *esprit* of a force, unless summarily repressed, it is considered necessary to retain the power—however rarely exercised—of inflicting the painful and humiliating punishment of flogging. The French soldier, though escaping the ignominy of personal chastisement, is governed by a code harsher than our articles of war as actually administered; and the punishment of death, scarcely known in the British service during peace, is not unfrequently visited in France upon offenders against discipline.

FLOOR-CLOTH, a coarse canvas coated on both sides, and partly saturated with thick oil-paint, one side having usually a coloured pattern printed upon it in oil-paint. The canvas basis for floor-cloth is chiefly manufactured in Dundee. As it is required to be without seam, and of sufficient width to cover considerable spaces of flooring, special looms are required for weaving it. It is made from 18 to 24 feet in width, and in lengths from 100 to 113 yards.

The first step towards converting this canvas into floor-cloth consists in stretching it on a frame. This is a work of some difficulty, on account of the great size of the pieces. Some of the frames are as much as 100 feet in length by 24 feet in height, and the canvas must be stretched over it as tight as a drum. The back or plain side of the cloth is first operated upon, by *priming* it with a solution of size, and scouring it with pumice. The object of this is to prevent too much of the paint from penetrating the canvas, and rendering it brittle, and to make an even surface to receive the paint, which is mixed with linseed oil, with very little or no turpentine, and is consequently thicker than common paint. This is thrown or splashed upon the surface with a brush; and then with a long steel trowel the workman spreads the dabs of paint, and produces a tolerably smooth surface. This *trowel-colour* is left for 12 or 14 days to dry, and then another coat is laid on in a similar manner; and this completes the back or under side of the floor-cloth.

While the first coat of the back is drying, the front is *primed* and pumiced, and a coat of trowel-colour laid on. As more care is required on this side, this coat of colour is scoured quite smooth with pumice, and two more trowel-colours are added, and each scoured like the first. Another coat is now carefully laid on with a brush, and is called a *brush-colour*. This forms the ground upon which the pattern is to be printed.

The printing is done by means of wood-blocks. The pattern is first drawn and painted, in its complete form and colours, upon a piece of paper; another piece of paper is now laid under this, and the outlines of that portion of the pattern included in one colour are pricked through to the lower paper. In like manner, pricked outlines of each of the other colours are prepared. Each of these pricked sheets is laid upon a block of pear-tree wood, and dusted over with powdered charcoal or lampblack, and thus the pattern is drawn in dots upon the wood; the carver cuts away the wood surrounding the pattern, and leaves it standing in relief.

The pear-tree blocks are backed by gluing them to a piece of deal, and this piece again to another, with the fibres at right angles, to prevent warping.

The colours are spread by boys upon padded cushions covered with floor-cloth, and each printer dabs his block upon that containing the required colour, and then places it upon the floor-cloth, and striking it with the handle of a short heavy hammer, prints his portion of the pattern. He then proceeds with a repetition of this, and as he advances, he is followed in order by the printers of the other colours, who place their blocks accurately over the pattern the first has commenced. The first printer's chief care is to keep the repetitions of the pattern accurately in line.

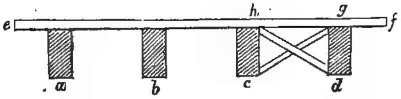
The quality of floor-cloth depends mainly upon the number of coats of paint, the kind of medium used for the colour, and the time given to drying. For the best qualities, a fortnight must elapse between the laying on of each coat, and finally, several months' exposure in the drying-room is necessary. As the rental of the space thus occupied, and the interest of the capital left stagnant during this time, amount to a considerable sum, there is a strong inducement to manufacturers to hasten the processes, which may easily be done by using gold size or boiled linseed oil, or other rapid 'dryers,' instead of raw linseed oil; but just in proportion as the drying is hastened by these means, the durability and flexibility of the floor-cloth are deteriorated. In order to secure the maximum of durability, floor-cloth should still be kept three or four years after it has left the drying-room of the manufacturer, and purchasers should always select those pieces which they have reason to believe have been the longest in stock. Narrow floor-cloth, for stair-carpeting, passages, &c., is made as above, and then cut into the required widths, and printed. It usually has a large pattern in the middle, and a border of a smaller design.

The laying of lobbies and passages with encaustic tiles has lately led to the superseding of floor-cloth in such situations, while for some other purposes, such as covering the floors of churches, reading-rooms, and waiting-rooms at railway-stations, it is superseded by the newly invented material called kamptulicon, or vulcanised India-rubber cloth, which is impervious to wet, soft and quiet to the tread, and warm to the feet. This new material is made plain or figured to resemble painted floor-cloth.

FLOORS, FLOORING, the horizontal partitions between the stories of a building, the upper part of which forms the floor of the apartments above, and the lower portion the ceiling of those below..

Floors are variously constructed, according to their dimensions, and to the weight they have to sustain. *Single-joisted floors* are the simplest and most cheaply constructed, and are used for ordinary buildings, where the distance between the bearings does not exceed 20, or at most 24 feet.

The annexed figure represents a section of a single-joisted floor, in the line of the flooring-boards, and across the joists. These joists are beams laid edge upwards, and resting at their ends upon wall-plates built into the walls. Their width should not be less than two inches, for if narrower, they would be liable to split with the nailing of the flooring-boards. They are placed edge upwards, in order to economise timber, as the strength of a beam to bear a transverse strain varies simply with the breadth and with the square of the depth. See STRENGTH OF MATERIALS. When a deep and long joist is used, there is danger of its twisting or turning over; this is prevented by *strutting*, that is, nailing cross pieces of wood between them, as shewn between the joists *c* and *d* of the figure, or less effectually, by driving pieces of planking between them. Strutting is required when the length of the joists exceeds eight feet. The laths for the ceiling of the room below are nailed to the bottom of the joists. In good substantial work, the distance between the joists from centre to centre is about 12 inches, but this is often exceeded in cheaply built houses.



a, *b*, *c*, *d*, the joists; *e*, *f*, the flooring-boards; *cg* and *dh*, herring-bone strutting.

Double-joisted floors are constructed by laying strong timbers, called *binding-joists*, from wall to wall, at a distance of about six feet apart; and a double set of joists, one above for the floor, and one below for the ceiling, are laid across these, and notched down upon them. These latter, when thus placed, are called *bridging-joists*, as they bridge over the interval between the larger binding-joists. This is adopted when a more perfect ceiling, free from cracks, produced by the yielding of the floor, is required, or where there is a difficulty in obtaining a sufficient amount of long timber for single joisting the whole of the floor.

The framed floor is one degree more complex than the double-joisted. Binding and bridging joists are used in the framed floor, but the binding-joists cease to be the primary support, as for this purpose strong balks of timbers, called *girders*, are used. They are laid across, at distances of from eight to ten feet, and the binding-joists are framed into them by a *tusk-tenon* joint. See Carpentry. The bridging-joists are notched to these in the same manner as for double-joisted floors. A *bay* is the general name for the space between girders: if between a girder and wall, it is called a *tail bay;* or between two girders, a *case bay;* and the work between is described as a *bay of joisting.*

When the space to be spanned is too great for a simple wood-girder, trussed or built up wooden girders or iron girders are used: the latter have of late come into extensive use, even where simple wood-girders are applicable. See Girder.

With a given quantity of timber, and a moderate space, the single-joisted floor is the strongest of any. One of its disadvantages is the free communication of sound to the apartment below, unless some additional means of obstructing the sound be adopted.

When first laid, the floor should be rather high in the centre, to allow for settling at the joints; and when settled, it should be perfectly level, for if it rises in the middle, it will exert an outward thrust upon the walls, and if hollow, it will pull inwards; but if level, its whole strain is perpendicular.

The flooring-boards are usually nailed to the joists, and vary from 1 to 1½ inch in thickness; for common floors they are from 7 to 9 inches wide, but for better floors a width of only 3 to 5 inches is used. The advantage of the narrow boards is, that the shrinkage and warping have not so much effect on the spaces between. This refers to the ordinary deal-flooring used in modern British domestic buildings. The facing of the floor in many old mansions is formed of small pieces of oak carefully inlaid. See Parqueterie. For other kinds of inlaid fancy floors, see Mosaic, Encaustic Tiles, and Concrete. In France, and most of the southern continental countries, where carpets are rarely used, the flooring-boards of the better class of houses are made of hard wood, carefully and closely jointed, and these floors are commonly rubbed with bees-wax, and polished. In humbler dwellings, even the bedrooms are paved with tiles, or strong plaster, or concrete; and considering the prevalence of fleas, &c., in such places, they are certainly better adapted for them than our deal-boards and carpets. They may be freely sprinkled, and even swilled with water in hot weather.

For warehouses where heavy goods are stored, for ball-rooms, &c., special construction is required to adapt the floor to the strain put upon it.

FLO'RA, among the Romans, was the name of the goddess of flowers and of the spring, and was latterly identified with the Greek *Chloris.* Her temple was situated in the vicinity of the *Circus Maximus.* The worship of F. was one of the oldest manifestations of the Roman religious feeling, and is affirmed to have been introduced by Numa. The *Floralia*, or festivals in honour of the goddess, were first instituted 238 B. C., and were celebrated from the 28th of April to the 1st of May, with much licentious merriment, prostitutes playing an important part on such occasions. On coins, F. is represented with a crown of flowers.—In Botany, the term Flora is a collective name for plants, and is used with regard to the vegetable kingdom in the same way as the term *Fauna* with regard to the animal. It is common to speak of the Flora of a country or district; and a work devoted to the botany of a country or district is often entitled a Flora of that region.

FLO'RENCE (Ital. formerly *Fiorenza*, now Firenze), the capital of Tuscany, is situated in the valley of the Arno, in lat. 43° 46′ N., and long. 11° 15′ E. It is about 123 feet above the level of the sea; 60 miles from Leghorn, 45 from Lucca, 40 from Siena, and 44 from Arezzo. Pop. 114,500. The Arno, spanned by four fine bridges, divides the city into two unequal parts, the chief of which stands on the northern bank of the river. In shape, an irregular pentagon, F. is enclosed by walls of about 6 miles in extent, and communicates with the exterior by means of eight gates, which conduct to thickly peopled suburbs, and a lovely, fertile, and salubrious neighbourhood, encircled by sloping hills, and studded with picturesque villas and fruitful vineyards and gardens. F. and her environs, viewed from the heights of Fiesole, appear but one vast city. Many causes render this city a most attractive place of residence to foreigners—a lovely country and healthful climate, cheap living, and the universal courteous intelligence of the people, united to the immense sources of interest possessed by the city in her grand historical monuments and collections of art. The massive and austere forms of Florentine architecture impart an air of gloomy grandeur to the streets, for the most part regular and well kept; but in the many feuds and civil convulsions of the city, these domestic fortresses were subjected to severe regular sieges and attacks, which lighter and more elegant structures could have ill withstood. The chief monuments of the city are Il Duomo, or the Cathedral, the foundations of which were laid with great solemnity in 1298. The Florentines having ambitiously resolved on erecting a monument which for architectural splendour and proportions should outvie all preceding structures, the honour of preparing the design was intrusted to Arnolfo de Cambio da Colle. On his death, Giotto superintended the works; and many eminent architects were employed before this splendid edifice was completed—Brunelleschi, the last, conceived and erected the grand cupola, so much admired by Michael Angelo as to have served him as model for that of St Peter's. At the side of the cathedral springs up the light and elegant bell-tower, detached, according to the custom of the times. In front is the Baptistery of San Giovanni, in form an octagon, supporting a cupola and lantern; all three edifices being entirely coated with a varied mosaic of black and white marble. Three bronze gates in basso-rilievo are a great additional adornment of the Baptistery; the two by Ghiberti have been immortalised by Michael Angelo with the name of Gates of Paradise. See Sgrilli's description. The church of the Santa Croce, the Pantheon of F. (built in 1294—architect, Arnolfo), contains monuments to Galileo, Dante, Machiavelli, Michael Angelo, Alfieri, &c. The church of San Lorenzo was consecrated as early as 393 by St Ambrose, and rebuilt by Brunelleschi in 1425, by command of Giovanni and Cosmo de' Medici. It contains an interesting monumental memorial of Cosmo il Vecchio, bearing inscribed the title *Pater Patriæ*, which had been conferred on his memory by public suffrage the year following his death. In the *Nuova Sagrestia*, or New Sacristry, are the two famous monuments of Michael Angelo to Julian and Lorenzo de' Medici. The figures of these two statues are marvels of deep and living expression, and unsurpassable in their mute and eloquent beauty. The Medicean chapel, gorgeous with the rarest marbles and most costly stones, agate, lapis lazuli, chalcedony, &c., stands behind the choir, and contains the tombs of the Medici family, and those of the grand dukes their successors. Annexed to the church is the Laurentian Library, with its inexhaustible store of rare MSS., founded by Giulio de' Medici. Bandini has published the catalogue of the Greek, Latin, and Italian MSS.; and Biscioni and Assemani those of the Hebrew and Oriental ones. Amongst the numerous palaces, *Il Bargello*, now converted into a prison, is one of the most ancient, and was formerly the abode of the republican magistrate, the Podestà. In 1841, some interesting portraits were brought to light by the removal of a coating of whitewash from the revered features of Dante, Brunetto Latini, Corso Donati, &c., in the chapel of the palace. The Palazzo Vecchio, the seat of the republican government from its establishment till 1530, when it was abolished, is an imposing mass of building, surmounted by a lofty tower 260 feet high, the great bell of which used to warn the citizens of danger, or summon them to defence. Adjoining the palace is the Piazza del Palazzo Vecchio, a square containing a fine collection of statues, and a noble arcade, the Loggia de' Lanzi, under the porticos of which are magnificent groups of sculpture (see Rastelli's *Illustrazione Storica del Palazzo della Signoria detto Palazzo Vecchio*); Gli Uffizi, a handsome building between the Palazzo Vecchio and the Arno, founded by Cosmo I., in the first floor of which are deposited the archives of the court of justice and other public offices, also the Magliabechi Library of 150,000 volumes, and 12,000 MSS. On the second floor, in a circular suite of 23 rooms, is contained the famous Florentine gallery of art; rich in paintings, engravings, sculpture, bronzes, coins, gems, and mosaics. A splendid apartment, known as the Tribuna, contains the rarest treasures of the collection, and is in itself a wonder of art, with its cupola inlaid with mother of pearl, and its rich marble pavement. The Palazzo Pitti, the modern grand ducal residence, boasts of a superb gallery of paintings, and of a collection of 70,000 rare volumes, and 1500 MSS.

The Palazzo Riccardi, now public property, is much frequented for its fine library. The Palazzo Strozzi is a fine type of Tuscan architecture. Florence abounds in other public edifices and monuments well meriting notice, but our limits oblige us to omit all mention of them. The practical and philanthropical institutions are also numerous and excellently organised. The hospital of Santa Maria Nuova contains a college of medicine and surgery, which enjoys a European fame. The Academy of the Fine Arts and the Museum of Natural History afford unlimited resources to the public interested in their collections. There are three hospitals, one lunatic asylum, nine theatres. The Academy della Crusca, is intrusted with the care of sifting and preserving uncorrupted the Italian language. The Academy dei Georgofili was established in the interests of agriculture, the progress and needs of which it reports quarterly in the *Giornale Agrario Toscano*. For a detailed description of F., see *Guida della Città di Firenze*, 1822. The chief industrial occupations of the Florentines are the fabrication of silk and woollen textures, and of straw-plaiting for hats, &c., jewellery, and exquisite mosaics in rare stones. Education is more diffused in Tuscany than in any other Italian state; and the Florentines are famous for their caustic wit, and natural gifts of eloquence, as well as for their shrewd thriftiness and unflagging labour. In their moral superiority to other states may be recognised the effects of a better and more upright government than those which existed in most of the other divisions of the peninsula previous to the late partial union of Italy.

History of Florence.—The city of F. sprang originally from Fiesole (q. v.), at the foot of which it lies extended. The inconvenient and hilly site of the Etruscan Fiesole, perched on the crest of an irregular height, rendered the town so difficult of access to the traders who resorted to its market-places with their varied merchandise, that it was at length decreed they should assemble at the base of the hill, in the fertile plain traversed by the Arno. The few rough shelters erected for the accommodation of these traders may be considered the original nucleus of the important and splendid city of Florence. Such at least is the traditionary history of its origin generally accepted by the Florentine historians. It would seem that as early as the time of Sulla there had been a Roman colony here; another was sent after the death of Julius Cæsar, and it soon became a thriving town. The *Florentini* are mentioned by Tacitus, 16 A. D., as sending delegates to Rome, but it was not till the time of Charlemagne that F. began to rise out of obscurity. It was now governed by a political head with the title of Duke, assisted by various subordinate officers, who were elected by the united suffrages of the duke and citizens. In the 11th c., F., and a great part of Tuscany, were bequeathed to Pope Gregory VII., by his friend and partisan the Countess Matilda, who inherited from her mother, the Countess Beatrix, her jurisdiction over the city. Under the protection of Rome, F. speedily adopted the forms and institutions of a free city; and the republican spirit which then arose amongst the people imparted an impulse to national and individual life, and awoke a spirit of ardent patriotism and splendid enterprise. As early as the 11th c., the Florentines were European traders, and the possessors of grand commercial dépôts in the seaports and cities of France and England, and their skill as workers in gold and jewels had grown proverbial. In proportion as papal preponderance increased in F., that of the empire sank; and in 1113 the citizen forces routed the troops, and slew the delegate of the emperor at Monte Cascioli, near Florence. During the bitter wars between pope and empire, F. and all Tuscany seemed to have been saved from the civil feuds which raged throughout Italy between the contending factions of Guelphs and Ghibellines; the former, adherents of the pope; the latter, of the empire. But in 1215, F. became involved in the great party struggle, owing to a private feud breaking out between two noble families, chiefs of the contending principles. A Guelph noble, Buondelmonti, mortally incensed the Ghibelline family of the Amidei, by breaking off his alliance with a daughter of their house, and contracting marriage with a member of a Guelph family. To avenge this insult, the Amidei appealed to their powerful kinsmen, the Uberti, and, in fact, to all the Ghibelline party of Florence. Buondelmonti was stabbed to death as he crossed the bridge of the Ponte Vecchio, and was speedily avenged by the Guelphs in the blood of his enemies. Thus for 33 years was F. distracted by the deeds of bloodshed and violence of these two rival factions, who assumed the names, and adopted the respective causes of Guelph and Ghibelline. See GUELPH AND GHIBELLINE. In 1250, the animosity of these parties seemed somewhat blunted, and public attention was directed to wise internal reforms. Twelve magistrates, or anziani, were appointed in place of the consuls, each of the six sections into which the city was divided being intrusted to two of these magistrates, whose tenure of office was annual. To avoid all local dissensions, two other magistrates, strangers by birth, were elected: the one, invested with supreme authority in civil and criminal cases, was called the podestà; the other, with the title of captain of the people, had the chief command of the militia, in which were enrolled all the youth of the state, who were bound, at the call of this magistrate, to join their company fully equipped for fight: 20 companies defended the town, 96 the country. After the death of the Emperor Frederick II., the great protector of the Ghibellines, the Guelph or papal party gradually rose in power in F., and during ten years of their predominance, the city ascended in grandeur and prosperity, until it stood not only the first in Tuscany, but one of the first of all Italy. In 1254, the Florentines first coined their noble golden florin, unequalled at the time for beauty: in weight, a drachm, it bore on one side the national emblem, a lily; and on the reverse, the effigy of the popular patron, St John the Baptist. It commemorated a period of great success in the annals of F., whose forces had successively humbled the adjoining towns of Siena, Arezzo, Pisa, and Pistoja in 1252, and in 1254 captured Volterra. In 1260, the standard of civil war was again raised by the Ghibellines of F., who, in league with Manfred of Naples, attacked the Guelphs, and cut their forces to pieces in the sanguinary battle of Monte Aperto. The conquerors entered F. forthwith in the name of Manfred, abolished all trace of the popular institutions, establishing an exclusively aristocratic executive, and even strongly advocated the entire destruction of the city, the hotbed of Guelphism. This barbarous scheme was indignantly repudiated by their own famous leader, Farinata degli Uberti, immortalised by Dante for his patriotism. He declared his intention of heading the Guelphs, were such a sacrilege perpetrated by his own party. Pope Urban IV., French by birth, summoned against the Ghibelline Manfred a French army, led by Charles of Valois, to whom he offered the prospective kingdom of the Two Sicilies. Manfred was defeated and slain in the famous battle of Benevento, and Guelph ascendency was restored anew throughout Italy and Florence. Charles fully restored to the Florentines their internal institutions, and received their offered allegiance for ten years, 1266. In 1282, the *Priori*, a new executive power, was established in F.; and in 1293, by the consent of the Priori, a higher chief than their own order was elected, with the title of *Gonfaloniere*. In 1300, Dante became one of the Priori, and the former feud was recommenced with new vigour between two factions, who bore the names of Bianchi (Whites) and Neri (Blacks). Their dissensions were, however, interrupted by the appearance of Charles of Valois, sent by Boniface VIII. to restore tranquillity, 1301. Charles espoused the part of the Guelphs or Neri, and sanctioned every outrage on the Bianchi, who were plundered and murdered barbarously, the survivors being exiled and beggared; among these were Dante, and Petracco dell' Ancisa, the father of Petrarca. In 1306, Pistoja was besieged, and taken by famine with great barbarity. In 1315, the Florentines met with a severe check from the Ghibellines of Pisa, under the command of Uguccione della Faggiula; and in 1325, were completely defeated by Uguccione's successor in command, the valiant Castruccio Castracani, in the battle of Altopascio. F., weakened by long dissensions, and alarmed by Castruccio's threat of marching on the city, appealed to the king of Naples for aid. They received joyfully an officer of the king, entitled the Duke of Athens, sent as royal vicar; and such was the public demoralisation of the moment, they proclaimed him dictator of the republic, unanimously suppressing the offices of priori and gonfaloniere. The intrigues of this ignoble schemer to overturn the republic being discovered, he was ignominiously expelled by a general popular rising, and narrowly preserved his life. An attempt to admit a proportion of the nobles into the government signally failed at this time, and only led to renewed animosity between them and the citizens. This was the last effort of the nobles to secure power. See Machiavelli, book ii. A terrible pest decimated F. in 1348, sweeping off 100,000 of her inhabitants. See Boccaccio, *Decameron*. The chief power of F. about this time seems to have been alternately wielded by the democratic families, the Alberti and the Ricci, and by their patrician rivals, the Albizzi, who, for the space of 53 years, guided the republic in the path of independence and progress. In 1406, the ancient and illustrious republic of Pisa (q. v.) fell under the sway of F., after a most heroic resistance. From 1434, the history of F. is intimately bound up with the House of Medici, whose influence supplanted that of the Albizzi. See MEDICI. The Medici were repeatedly banished from F., in consequence of their aiming at sovereign power; and to their intrigues F. owes her final loss of republican rights and institutions. Pope Clement VII., of the House of Medici, formed a league with the Emperor Charles V., by which the liberties of F. were to be extinguished, and the sovereign power to be invested in the pope's bastard son, Alexander de' Medici. In September 1529, an army of imperialists, under the Duke of Orange, entered Tuscany; and on the 8th of August 1530, the siege of F. terminated, after a defence of unexampled devotion and bravery on the part of the citizens. Thus fell the name and form of the republic of F., quenched in the best blood of the city, a sacrifice to a renegade pope, who employed both foreign robbers and internal traitors to destroy and humiliate the city of his birth. From this period, F. loses her distinctive history, and is only known as capital of the grand duchy of Tuscany, Pope Clement having conferred on Cosmo de' Medici the ducal dignity. Some idea of the splendour and prosperity of F. as a republic may be had from the fact, that her capitalists were so enormously wealthy, they supplied the chief sovereigns of Europe with funds; her manufactures of wool, silk, and gold brocade were exported throughout the world; and besides home centres of commerce, she possessed great commercial establishments in all the countries of Europe. This wonderful prosperity the Florentines owed solely to their indomitable spirit of enterprise, and to their industry, energy, and independence.—Compare the writings of Machiavelli, Guicciardini, Sismondi, Varchi, and Denina.

FLO'RÉS, as the name of various islands, occurs in Asia, North America, South America, and the Azores.—1. In the Malayan Archipelago, about half way between Java and the eastern extremity of the chain. It lies due south from Celebes, stretching in S. lat. from 8° to 9°, and in E. long. from 120° to 123°. Like most members of the group, it is of an oblong shape, measuring 200 miles in length by an average breadth of 35. In common with the rest of the cluster, the island is of hilly character and volcanic origin. It produces cotton, sandalwood, and bees-wax; and its principal trade is with Singapore.—2. The most westerly of the Azores, with a population of about 10,000—lat. 39° 25′ N., and long. 31° 12′ W.—3. In the Pacific Ocean, a little to the west of Vancouver Island—lat. 49° 20′ N., and long. 126° W.—4. In the Plata, about 20 miles below Monte Video, in the republic of Uruguay, in lat. 34° 56′ S., and long. 55° 55′ W.

FLO'RET. See FLOWER.

FLO'RICULTURE, or CULTIVATION OF FLOWERS. From the earliest times, and wherever any considerable progress has been made in civilisation, plants have been cultivated for the sake of their beautiful or fragrant flowers. Flowers have been very generally employed not only to afford gratification, and for the adornment of the person and of houses, particularly on festive occasions, but in many countries also in connection with religious rites. Flower-markets existed in ancient Athens, as in the richest capitals of the modern world. India, China, and Mexico have been famous for the cultivation of flowers, from the earliest periods to which their history can be accurately traced. Artificial means have been employed for the protection and cultivation of delicate exotics, prized only on account of their flowers, far more generally and assiduously than for the cultivation of any fruit-bearing, culinary, or otherwise useful plants. Those who cannot afford more than a very small green-house, almost always devote it to flowers; and those who cannot attain even this, have a few favoured plants under a frame, or at least in a window.

Flowers are either cultivated in borders of a garden mainly appropriated to fruit-trees and culinary vegetables, or a separate flower-garden is formed, consisting generally of parterres cut out of a lawn. Of late years, the separate flower-garden has become much more common than formerly. There is much room for the display of taste in the form and grouping of its parterres, and both in it and in the humbler flower-border, in the arrangement of the flowers themselves. A common rule has always been to place the plants of tallest growth generally at the greatest distance from the walks or alleys from which they are to be viewed, and those which scarcely rise above the ground, nearest to the spectator: it is also of evident importance, except in extensive gardens, that every border or parterre should be gay with flowers during all the spring, summer, and autumn, on which account attention must be paid to the intermixing of plants that flower at different seasons, and for this purpose annuals are often sown amongst perennial plants and shrubs; whilst it is always necessary to take care that the combination of colours be such as to please and not offend the eye, in order to which *complementary colours* are brought together—red and green, blue and orange, yellow and violet—whilst a judicious mixture of white blends and harmonises those which would otherwise appear unpleasantly contrasted. This rule is equally applicable to the grouping of flowers in one border, or of parterres in which masses of the same colour are exhibited, often produced by an extensive planting of the same flower, a practice which has recently become common, and by which the greatest splendour of general effect is produced.

The flower-garden requires the same attention to the habits of particular species, and the same assiduity in digging, cleaning, &c., which are requisite in other departments of horticulture. Perennial herbaceous plants generally require to be not unfrequently renewed by parting of the roots or otherwise, as the tuft extends and the flowering stems become more numerous, but weaker and less productive. Many plants are placed in the flower-garden in summer, which require the protection of the frame or green-house in winter.

In no department of horticulture have greater changes been effected by cultivation. Even the practised eye has often some difficulty in recognising the splendid varieties which the florist has produced, as the progeny of the unpromising original form. One of the most common effects of cultivation is the production of double flowers, in which the stamens have been converted into petals, as in roses, so that if the flower is perfectly double, it can produce no seed by itself; or, in the case of composite flowers, the florets of the disc assume the same form with the florets of the ray, as in dahlias, asters, &c. Much improvement has been effected by crossing, not so frequently by the real hybridisation of different species, as by the intermixture of artificial varieties already obtained; and many of the finest varieties are the mere result of the careful selection and cultivation of individual plants of superior beauty, and of their progeny.

The green-house, conservatory, stove, &c., in which exotic flowers are cultivated, are noticed in separate articles. But perhaps this article would not be complete without some notice of *window-gardening*, by which a charm is added even to the abodes of the wealthy, particularly in cities, and by which even the poor have the delight of tending a choice exotic or two, and becoming familiar with the beauty of their flowers. The care requisite in window-gardening is the same as for plants kept in flower-pots in the green-house; there must be the same re-potting, pruning of the roots, &c., from time to time, and at least as much attention in giving water and air. Of the former, the most common mistake is to give too much, and of the latter too little. It is a good rule, that except immediately after water is given, it should never be seen in the saucer; nor should the earth appear *very* moist. The situation, however, being in many respects less favourable, many plants, as heaths, which are frequent in green-houses, cannot be successfully cultivated in the windows of apartments. The common notion that the burning of gas in apartments injures window-plants, does not appear to be well founded. WARDIAN CASES, by means of which many delicate plants are produced in the greatest perfection in the windows of apartments, are noticed in a separate article.

Horticultural Societies (q. v.) have of late done much for the encouragement of the cultivation of flowers, and particularly among the humbler classes of society, with evident increase of amenity within and around their abodes, and an unquestionable tendency to refinement of habits and feelings.

FLO'RIDA, the name of the most southerly member of the United States, or rather of the Confederate States, of America. Including its adjacent islands and its reef-like chain of keys on the south-west, it stretches in N. lat. between 25° and 31°, and in W. long. between 80° and 87° 44′. The greater portion of it forms a peninsula stretching south-south-east towards the Bahamas, having the Atlantic on the one side, and the Gulf of Mexico on the other. It adjoins, on the north, the states of Georgia and Alabama. Its greatest breadth, from the Atlantic to the river Perdido, is 360 miles; its greatest length about 400 miles; the average breadth of the peninsular portion upwards of 120 miles; area, 60,000 square miles. The principal rivers are the St John's, running north-east through the peninsula, and entering the sea near Jacksonville after a course of 300 miles; the Suwanee, flowing south from Georgia into the Mexican Gulf at Wacassa Bay; the Appalachicola, the Choctawhatchee, Escambia, and Perdido. The principal towns are Tallahassee, the seat of government, situated near the middle of the northern boundary; St Mark's on the Gulf; St Augustine on the Atlantic, the Spanish capital, and the oldest settlement in Anglo-Saxon America; and Pensacola, a port near the Perdido, in the extreme west of the state, recently rendered so conspicuous in the war of secession.

In physical character, the state, generally speaking, is part of the sandy and marshy belt which forms the immediate seaboard from the Potomac to the Mississippi. Nay, far beyond the average of the contiguous shores in either direction, it may, almost without a metaphor, be described as amphibious. To say nothing of inlets, which carry the tide within fifty miles of every point, the interior may literally be said to teem with fresh water, here and there welling up into considerable streams from springs ranging to 250 fathoms in depth. This is more emphatically true of the south, where an immense district, known as Everglades, exhibits, as its normal condition, the ordinary phenomena of a casual inundation. Though the surface is thus better adapted to pasturage than to tillage, yet, in favourable localities, the soil, rather through the abundance of heat and moisture than from any inherent fertility, largely yields such productions as sugar, cotton, and rice. Considering that the state shares with the Bahamas the dominion of that grand highway of commerce, the Gulf Stream (q. v.), its inexhaustible growth of timber for ship-building is peculiarly valuable. Its coasts and rivers swarm with shoals of fish; while its dependent keys, periodically crusted with salt of the sun's making, furnish the means of curing them.—*Florida*, so called because of its exuberant vegetation, was first made known to Europeans by Ponce de Leon, who landed near St Augustine in 1512. In 1539 it was explored by Fernando de Soto. Originally, the term F. vaguely indicated among the Spaniards the eastern side of the new continent to the north of Mexico, just as the term California received a similarly loose interpretation on the western coast. Gradually, however, it came to be circumscribed by the encroachments of rival powers—its first definite boundaries being established with reference to the claims of English Georgia and French Louisiana. Even within these limits, it embraced, in addition to the F. of the present day, the maritime borders of Alabama and Mississippi. Thus fixed in position and extent, the colony was ceded to England in 1763, and recovered by Spain in 1781. In 1803, however, Louisiana having been bought by the United States from France, F. became to the former country a commercial and political necessity; and accordingly, in 1821, it was annexed to the great republic by a mixture of force and negotiation.

The same physical character of F. which impairs its economical worth, has added materially to the expense of its occupation. From about 1836 to 1842, the Seminole Indians, protected by their swamps against every civilised appliance but the blood-hound, tasked the resources of the American Union more than any other domain of equal size ever tasked them. Notwithstanding every drawback, the country, possessing as it does, a comparatively salubrious climate, has made a reasonable progress in wealth and population. In 1850, 349,423 acres were under cultivation; and in 1855, the assessable capital was estimated at about 50,000,000 dollars—nearly 14,000,000 in lands, fully 27,000,000 in slaves, and more than 8,000,000 in other descriptions of property. It is only recently that railways have been introduced into Florida. A system of about 700 miles had been projected, and in 1859 there were 216 miles completed. According to the national census of 1850, the inhabitants numbered 87,401, of whom 39,309 were slaves; under local returns of 1855, the corresponding totals were 110,823 and 49,526. The national census of 1860 gave 78,686 free, and 61,753 slave; total, 140,439.

FLORIDA, GULF OF, the name given to the channel between Florida and the Bahamas, traversed by the Gulf Stream (q. v.). From Florida Reefs on the south, to Settlement Point, the most northern of the Bahamas in the channel, is 200 miles long; greatest breadth at the southern extremity, 150 miles; at the northern extremity, 65 miles.

FLORIDA BLANCA, DON JOSEFO MONINO, COUNT OF, prime minister under Charles III. of Spain, was born in 1728 at Murcia, where his father was a notary. Having studied at Salamanca, he gained soon after such distinction that he was appointed Spanish ambassador to Clement XIV. of Rome. In that office, he displayed great ability, especially in the abolition of the order of Jesuits and the election of Pius VI. Grimaldi, Spanish minister of Foreign Affairs, on being dismissed, was asked by the king to nominate a successor, and accordingly proposed Monino. Charles followed his advice, created Monino Count of Florida Blanca, and intrusted to him, besides, the department of matters of justice and mercy, as well as the superintendence of posts, highways, and public magazines. F. used this extensive authority in introducing post-coaches and good post-roads, in improving the capital, and attending to other important departments of general police, as likewise in actively promoting the arts and sciences. His effort to confirm the good understanding between Spain and Portugal by a double marriage, which would have secured the Portuguese throne to a Spanish prince, was unsuccessful. His military undertakings also, the attack upon Algiers in 1777, and the siege of Gibraltar in 1782, issued unfortunately. Before the king's death in October 1788, F. presented a defence of his administration, with a request for leave to resign. The defence was accepted, but the request refused. However, under Charles IV. in 1792, F.'s enemies obtained his disgrace. Imprisoned at first in the citadel of Pampeluna, he was afterwards released, and banished to his estates. He appeared again at the meeting of the Cortes in 1808, but died November 20 of the same year.

FLORIDEÆ. See CERAMIACEÆ.

FLORIN was the name of a gold coin first struck in Florence (q. v.) in the 13th century. It was the size of a ducat, and had on one side a lily, and on the other the head of John the Baptist. Some derive the name from the city, and others from the flower. These coins were soon imitated all over Europe. It was out of them that the German gold guldens of the middle ages and the modern guldens arose. These last are still marked by the letters *Fl.* The gulden or florin is the unit of account in Austria and the south of Germany. Its value in Austria is 2*s.* English; in the other states, 1*s.* 8*d.* The name has been recently applied to the English two-shilling piece.

FLORI'NIANS, a Gnostic sect of the 2d c., so called from a Roman priest, Florinus, who, with his fellow-presbyter, Blastus, introduced doctrines resembling those of Valentinus, into Rome, in the pontificate of Eleutherius (176), and was excluded from communion by that pontiff. See GNOSTICISM, VALENTINIANS.

FLO'RISTS' FLOWERS are those kinds of flowers which have been cultivated with peculiar care, and of which, consequently, there exist numerous varieties, differing very much in appearance from each other and from the original flower. Such are tulips, hyacinths, roses, auriculas, carnations, anemones, ranunculuses, dahlias, &c. The special cultivation of particular flowers was first prosecuted to a remarkable degree in Europe by the Dutch in the beginning of the 17th c., and from the Netherlands a passion for it extended to other countries, particularly to England and Scotland, when the religious persecutions drove many refugees to the British shores; and to this day it prevails most of all where the branches of manufacture introduced by the refugees are carried on. In the little gardens of operatives in some of the manufacturing towns may be seen many of the finest tulips and carnations in Britain. It is still, however, in Holland, and particularly at Haarlem, that this branch of gardening is carried on to the greatest extent, and it is from that quarter that the market of the world is chiefly supplied with bulbs, seeds, &c. Between Alemsei and Leyden are more than twenty acres appropriated to hyacinths alone, which succeed best in a loose sandy soil. The cultivation of roses at Noordwyll, in South Holland, is carried on in considerable fields situated in the *dunes*, and affords support to many families. Berlin has of late years become the seat of a flower-trade, which partially rivals that of Holland. Some flowers, as dahlias and hollyhocks, are produced in greatest perfection by British cultivators. The Chinese have had their florists' flowers, camellias, hydrangeas, tree peonies, &c., from time immemorial.

In the years 1636 and 1637, an extraordinary flower-mania prevailed in Holland, chiefly with reference to tulips, in which men speculated as we have recently seen them do in railway shares. Bulbs were sold for enormous sums. For a single *Semper Augustus* (a tulip), 13,000 florins were once paid, and for three such together, 30,000 florins. The ownership of a bulb was often divided into shares. Men sold bulbs, which they did not possess, on condition of delivering them to the buyers within a stipulated time; and of some varieties, far more bulbs were sold than actually existed. But these extravagances soon ceased, although not till they had involved many persons in ruin.—It was not till about the year 1776 that the real flower-trade of Holland reached its greatest importance; from which time it has rather declined. New varieties of tulips and hyacinths are sometimes marked in the Haarlem catalogues at prices from 25 to 150 florins.

FLO'RUS, generally, but on insufficient evidence, called L. Annæus F., was a Roman historian who flourished in the reign of Trajan or Hadrian. Of his life we know absolutely nothing. He wrote an epitome of Roman history (*Epitome de Gestis Romanorum*), from the foundation of the city to the time of Augustus. This work, which is still extant, is carefully and intelligently composed, but is disfigured by an inflated and metaphorical style. Since the *editio princeps*—if, indeed, it be such—printed at the Sorbonne in 1471, F.'s epitome has been published times without number. The best modern edition is that of Dukerus (Lug. Bat. 1722, 1744; Leip. 1832).

FLOTANT (Fr.), used in Heraldry to express that the object is flying in the air, as a banner-flotant.

FLO'TSAM. Wreck, in the legal acceptation of the word, is goods which, having been scattered by a shipwreck, have floated to land. From goods in the position of wreck are distinguished those known to the law of England by the uncouth expressions *flotsam*, *jetsam*, and *ligan*. The first is where the goods continue floating on the surface of the waves; the second is where, being cast into the sea, they sink and remain under water; the third is where they are sunk in the sea, but are tied to a cork, bladder, or buoy, in order that they may be recovered. If no owner appears to claim them, goods in these various positions go to the crown, so that by a royal grant to a man of *wrecks*, things *flotsam*, *jetsam*, or *ligan* will not pass. See JETSAM, and JETTISON, an important term in the law-merchant, from which jetsam must be carefully distinguished.

FLÖTZ (Ger. level), the name given by Werner to the secondary rocks of Lehmann, because, in the district in which he examined them, they were horizontal. He arranged the rocks which form the solid crust of the earth into four classes. 1. The primitive beds without organic remains, such as granite and gneiss; 2. The transition strata, which, from their more or less metamorphic condition, were related to the primitive rocks on the one side, and from their few contained organisms, to the flötz on the other; 3. The flötz containing all the sedimentary rocks, from the coal-measures up to and including the chalk; and 4. The newer strata, which he called the 'overflowed land' or alluvium. When the followers of Werner found that the horizontal position of the flötz was a local accident, they abandoned the term, and restored Lehmann's title of Secondary.

FLOUNDER (*Platessa*), a genus of fishes, of the Flatfish family (*Pleuronectidæ*), having one row of cutting teeth in each jaw, and generally pavement-like teeth on the pharynx; the dorsal and anal fins extending nearly the whole length of the body, the dorsal not coming further forward than the centre of the upper eye; the tail-fin distinctly separated both from the dorsal and the anal. To this genus belong the Plaice, Flounder, Dab, &c., of the British shores. The species generally known as the F. (*P. Flesus*), is very common, not only on the British shores, but on those of most parts of Europe. Its Swedish name is *Flundra*. Its Scottish name is *Fleuk* or *Fluke*, a name which, with additions, is extended to many other kinds of flat-fish. The F. is often a foot or more in length. Its greatest breadth, without the fins, is about one-third of the whole length, rather less than that of the plaice. It is easily distinguished from the plaice by a row of small tubercles on each side of the lateral line. The colour varies according to the ground from which the fish is taken. The F. is found chiefly in rather shallow water, with sandy or muddy bottom, and equally in the most perfectly salt water and in the brackish water of estuaries. It ascends still rivers into perfectly fresh water, and may be kept in fresh-water ponds. It lives long out of water, and is easily transferred to ponds.—The F., like the other fishes of this genus, generally swims on the left side, and has the eyes on the right side; but reversed specimens are of frequent occurrence.

FLOUR is a popular name given to the finer portions of meal or pulverised grain. Thus, *flour*, or *wheat-flour*, is the fine part of ground wheat; *pea-flour*, of pease, &c. See BREAD.

FLOUR, ST, a small town of France, in the department of Cantal, is finely situated on a steep basaltic plateau at an elevation of 3000 feet, 34 miles east-north-east of Aurillac. It is entirely built of lava and basalt. Its streets are narrow, and its houses in general have a miserable, dark, and dirty appearance. The principal building is the cathedral. A suburb lies at the foot of the rock, and communicates with the town by a winding road cut in the rock. F. has manufactures of hollow ironware, cloth, and table-linen. Pop. 5660.

FLOURENS, MARIE JEAN PIERRE, a celebrated living French physiologist, born in 1794 at Maureilhan, Hérault. After having obtained his degree of Doctor of Medicine at Montpellier, at the early age of 19, he proceeded to Paris, where he soon became acquainted with the Cuviers, Geoffroy St Hilaire, and other eminent naturalists. For the last forty years, F. has been a voluminous writer on human and comparative anatomy and physiology, on natural history, and on various special departments of the history of the natural and physical sciences.

Among his most important works we may mention his *Recherches Expérimentales sur les Propriétés et les Fonctions du Système Nerveux dans les Animaux Vertèbres* (1824); with a supplementary volume, entitled *Expériences sur le Système Nerveux* (1825); *Recherches sur le Développement des Os et des Dents* (1842); *Anatomie Générale de la Peau et des Membranes Muqueuses* (1843)—a work tending to demonstrate the unity of the human race, by shewing that there are no essential differences between the structure of the skin in the negro and the European—and his *Théorie Expérimentale de la Formation des Os* (1847), perhaps the most celebrated of his works. Among his smaller and popular works, are his *Analyse Raisonnée des Travaux de Georges Cuvier* (1841); *Buffon, Histoire de ses Idées et de ses Travaux* (1844); *De l'Instinct et de l'Intelligence des Animaux* (1841); *Examen de la Phrénologie* (1842); *Histoire de la Découverte de la Circulation du Sang* (1854); *De la Longévité Humaine, et de la Quantité de Vie sur le Globe* (1854); and his *Eloges Historiques*—a beautifully written series of scientific biographies.

As early as 1821, F. delivered a course of lectures on 'The Physiological Theory of Sensations,' and presented some of his first scientific contributions to the Academy of Sciences, into which body he was admitted as a member in 1828. About this date, he was appointed assistant to Cuvier; and in 1832, he succeeded to the full duties of the professorship of natural history in the Jardin du Roi. In 1833, he succeeded Dulong as Perpetual Secretary of the Academy of Sciences—an office which he still continues to discharge; and in 1840, the French Academy elected him a member. He was made a peer of France by Louis Philippe in 1846, and was appointed professor in the Collége de France in 1855. He is unquestionably the most popular French scientific writer of the present day.

FLOWER, or BLOSSOM, that part of a phanerogamous plant in which the organs of reproduction (*stamens* and *pistils*) are situated, and which consists essentially of a single group of these, generally surrounded by *floral envelopes* (the *calyx* and *corolla*). Both the organs of reproduction and the floral envelopes are metamorphosed leaves, and arise in successive whorls from a much shortened axis, called the *thalamus* (Gr. a nuptial-bed), or *torus* (Lat. a couch). Flowers are sometimes closely attached to the stem or branch from which they grow, and are then said to be *sessile* (Lat. sitting); but sometimes there intervenes a *flower-stalk* or *peduncle*, either simple or branched. The whole assemblage of flowers of a plant is called its *Inflorescence* (q. v.), and the different kinds of inflorescence, or modes in which the flowers are produced and grouped, are often as characteristic as the diversities in the flowers themselves, although the latter are in general more important with reference to botanical affinities.

In the very large natural order *Compositæ*, many small flowers are congregated on a common *receptacle*, and surrounded with *bracts* in the form of an *involucre*, as a single flower is surrounded by its calyx. The *head of flowers* is in this case popularly called a flower; and the individual flowers of which it is composed are by botanists styled *florets*. This term is also applied to the individual flowers in the *spikelets* of the Grasses (q. v.), of which the *glumes* are a common involucre.

The order of the whorls in flowers is invariable; the Calyx (q. v.) is always exterior to the Corolla (q. v.); within the corolla are the *Stamens* (q. v.), or male organs of reproduction, and in the centre of all is the *Pistil* (q. v.), the female organ of reproduction. An outer calyx, or whorl of metamorphosed leaves, exterior to the calyx, and usually smaller, is found in some flowers, as mallows, and is called the *epicalyx*. Within the corolla, there is sometimes an additional or supplementary corolla, called the *Corona* (q. v.), *coronet*, or *crown*. When the calyx and corolla are not easily distinguishable, the term *Perianth* (q. v.), or *perigone*, is employed, as in the lily, crocus, iris, and the greater number of endogenous plants, although even in these there are really two whorls closely united. In some flowers, there are several whorls of leaves forming one or each of the floral envelopes; and in like manner, some have several whorls of stamens, and sometimes there are several whorls of the carpels which form the pistil. In some flowers, certain whorls are entirely wanting; and thus not a few exogenous plants are destitute of the corolla, which is sometimes the case with plants—exceptional *apetalous* species—very nearly allied to others that have it. It is by a similar abortion of a whorl that flowers become unisexual. Both stamens and pistils are generally present in the same flower, which is called a *hermaphrodite* or *perfect* flower; but many flowers contain only the male organs of reproduction, and many contain only the female organs, and such flowers are described as *unisexual*, *Diclinous* (q. v.), or *imperfect;* and respectively, as *male* or *staminiferous*, and *female* or *pistilliferous* flowers. Male flowers are also called *barren* or *sterile*, and female flowers *fertile*, although their fertility depends on the communication of pollen from the staminiferous flowers. When both male and female flowers are produced on one plant, the species is said to be *monœcious* (Gr., having one house); but when they are on separate plants, it is *diœcious* (Gr., having two houses); those which produce male, female, and hermaphrodite flowers are called *polygamous*. Sometimes both stamens and pistils are wanting, and the flower is then said to be *neuter* or *empty*, as in the case of the florets of the ray in many composite flowers. Sometimes, on the contrary, both calyx and corolla are wanting, and then the flower is said to be *naked* or *achlamydeous* (Gr., without covering), as flowers having only one floral envelope are called *monochlamydeous*, and flowers having both calyx and corolla are called *dichlamydeous*. Achlamydeous flowers are often grouped in some peculiar manner, and protected by bracts or by a spathe.

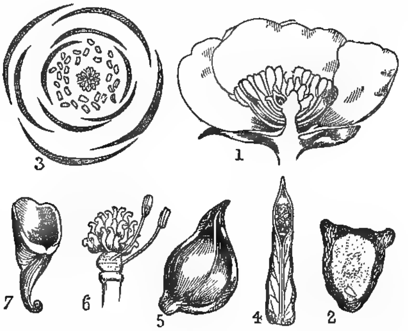


Illustration of some of the Principal Parts of a Flower (from Balfour's *Botany*):

1, Section of the flower of Ranunculus, shewing sepals, petals, numerous stamens, with adnate anthers, placed below the carpels. 2, Anatropal seed of Aconite, cut vertically, shewing abundant homogeneous albumen and a small embryo. 3, Diagram of the flower of Ranunculus, with five sepals, five petals, numerous stamens, and carpels. 4, Ripe follicle of Columbine. 5, Ripe achene of Ranunculus. 6, Numerous single-seeded carpels of Ranunculus. 7, Spurred petal of Columbine.

Flowers are always regular in their rudimental state—whorls of elevated points or *papillæ;* some of these, however, are not unfrequently abortive, whilst more frequently, some acquire a greater development than others of the same whorl, making the whorl and the flower *irregular;* and greater varieties of form are common in the metamorphosed leaves which compose the flower, than in true leaves themselves. The *internodes,* or portions of the axis between the whorls, are sometimes also peculiarly developed into *Disc* (q. v.), *Gynophore* (q. v.), &c. The different whorls often differ in their *Æstivation* (q. v.). But a beautiful symmetry may generally be traced in the arrangement of the parts of flowers, the whorls consisting of the same number of parts, and the parts of each whorl being placed opposite to the spaces of the whorl exterior to it; and this symmetrical plan of the flower remains manifest even when there is abortion or extraordinary development of particular parts. The number of parts in the pistil is, however, often smaller than in the exterior whorls; and sometimes particular parts appear to be divided, and so apparently multiplied, as the long stamens of the *Cruciferæ,* each pair of which is to be regarded as one stamen split into two, and has its place accordingly among the parts of the flower. The symmetry of flowers may be illustrated by the following diagrams:

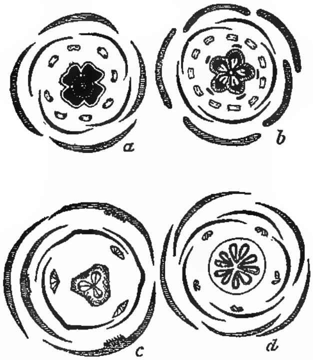


Illustration of the Symmetry of Flowers (from Balfour's *Botany*):

a, Diagram of the flower of Heath (*Erica*), having four sepals, four divisions of the corolla, eight stamens in two rows, and four divisions of the pistil. The flower is tetramerous, complete, symmetrical, and regular. *b,* Diagramatic section of a symmetrical pentamerous flower of Stone-crop (*Sedum*), consisting of five sepals externally, five petals alternating with the sepals, ten stamens in two rows, and five carpels containing seeds. The lines on the outside of the carpels are glands. *c,* Diagram of the trimerous symmetrical flower of Iris. There are three alternating divisions of each whorl. *d,* Diagram of the flower of Flax (*Linum*), consisting of five sepals, five petals, five stamens, and five carpels, each of which is partially divided into two. It is pentamerous, complete, symmetrical, and regular.

The development of flowers in most cases follows the complete formation of the stem-leaves, more rarely precedes or accompanies it. The unfolding of the parts of a flower is called its *flowering* or *blossoming,* and, when their functions are performed, it fades; the floral envelopes, the stamens, and even the styles, sometimes falling off early, and some of them sometimes remaining in a withered state until the ripening of the fruit; the calyx not unfrequently undergoing such modifications as to convert it into a part of the fruit itself.

In the greater number of plants, flowering takes place, during the flowering season, indiscriminately, at all hours of the day; and the flowers once opened, remain open, even during night, till they fade. In many plants, however, a *sleep of flowers* takes place; they open and close with the returns of day and night. Thus, *sunflowers* open in the morning, and close at evening; whilst there are other flowers which open in the evening, and close in the morning. Others also open and close at certain hours of the day; thus the flowers of the common purslane open about 11 o'clock A.M., and close soon after midday; *Anthericum pomeridianum* opens its flowers about 2 P.M., and closes them before night; the large fragrant blossoms of *Cereus grandiflorus* open between 7 and 8 P.M., and its sleep commences soon after midnight. In a few plants, the sleeping and waking of the flowers are regulated by the conditions of the weather. The waking and sleeping of flowers either continues for several days in succession, as in some species of *Mesembryanthemum;* or the brief life of the flower ends when it first sleeps, as in the Tiger-flower.

The odours of flowers, extremely various, often delightful, and sometimes very offensive, are in some cases equally powerful as long as the flower is open; in others, they vary in strength at different times of the day. Some flowers, as those of *Hesperis tristis* and *Pelargonium triste,* although remaining open during the day, diffuse their fragrance only when night comes on. The Oriental Hyacinth, so commonly cultivated in windows, is at all times perceptibly fragrant, but fills the atmosphere of the apartment with its perfume about eleven o'clock at night.

The colours of the different parts of flowers, the variety and beauty of which render many of them so attractive, generally remain unchanged, but sometimes undergo changes during the life of the flower. The flowers of *Myosotis versicolor*—a small species of Forget-me-not, very common as a weed in gardens—are sulphur-yellow when they first open, and afterwards change to blue. The petals of *Cheiranthus mutabilis,* when they first expand, are yellow, and afterwards pass to orange, red, and finally purple. In *Hydrangea hortensis,* familiar as a window-plant, the flowers are at first green, then rose-colour, purplish red intermixed with green, and finally, when about to fade, they are of a sickly green. Some flowers undergo remarkable changes of colour during the day, as those of the common pink *Phlox,* which, early in the morning, are light blue, and become bright pink as the day advances; and those of *Hibiscus variabilis,* which are white in the morning, pink at noon, and bright red at sunset.

The colours and odours of flowers are subjects in the investigation of which physiologists have not yet been able to go far. The chemical products on which they immediately depend are partially known; but how the chemical changes are wrought, and what various purposes they all serve as to the plant itself, can scarcely be said to have even begun to be ascertained. Both colours and odours are more or less owing to the action of the sun's rays. They are also sometimes modified by soil; and diversities of colour have been obtained in cultivated flowers by changing the soil in which they grow.

A few flowers are edible, although none are of any importance on this account. Some, or parts of them, are used in dyeing; but notwithstanding the beauty and variety of the colours of flowers, a very small proportion of vegetable dye-stuffs is obtained from them; and a similar remark is applicable to their medicinal use. For dyeing and painting, the colours of flowers can seldom be obtained in considerable quantity, except at too great expense, and seldom of brilliancy at all corresponding with that which they exhibit in the flower itself. They are also in general fixed with great difficulty, some yellow colours being the only notable exceptions.

Flowers being subservient to the reproduction of the species, are, in all not unfavourable circumstances, followed by Fruit (q. v.). This, of course, in monœcious and diœcious plants, is the case only with the female flowers, the male flowers soon withering away when they have dispersed their pollen. See FECUNDATION and STAMEN. But even after the fecundation of the germen, and when, in the language of gardeners, the fruit is *set*, unfavourable circumstances, such as excessive heat or cold, drought or moisture, want of due nutriment to the plant, or through excessive number of fruits set at once, to the individual fruit itself—often cause it to fall off early, long before it has attained its full size. See FRUIT.

FLOWER-DE-LUCE. See IRIS.

FLOWER-POTS are generally made of burnt clay, unglazed, tapering a little towards the bottom, and having the bottom perforated with one or more holes. Those of smallest size (*thumb-pots*) are only about two inches deep, and are used chiefly for seedlings to be soon again transplanted. For plants which require a pot of more than 12 inches deep and 18 inches wide, wooden boxes or tubs are generally provided. The flower-pot is usually placed in a saucer of the same material, when used in apartments, or on the shelves of a green-house; but when plants growing in flower-pots are placed in the garden, the saucer is dispensed with. For ornamental use, flower-pots are sometimes glazed, or made in the shape of vases, &c.—In filling flower-pots, small stones or bits of broken pottery are placed in the bottom, to prevent water from lodging there, and *souring* the soil in which the plant is to grow. The roots of plants growing in pots are generally examined once or twice a year, by turning them out of the pot with the whole ball of earth attached, when the roots, which have often become matted round the outside of the ball of earth, are pruned, and the plant is either restored to the same pot or transferred to a larger one. The change of soil made at this time is, according to circumstances, either complete or partial.

FLOWERS, ARTIFICIAL. This elegant branch of manufacture, though not usually ranked among the fine arts, may be fairly regarded as holding an intermediate place between them and the mechanical arts. The Italians were the first to bring it to a high state of perfection, and it is now successfully carried out both in England and France. The value of artificial flowers annually exported from France exceeds £40,000.

The materials used are very various. Feathers have long been used by the South American Indians. In Italy, the cocoons of silk-worms are dyed, and extensively used. Beautiful imitations of flowers are made from shells, either in their natural colours or tinted. Paper, ribbons, velvet, thin laminæ of whalebone, &c., are also used. The materials of which the artificial flowers commonly in use are made are French cambric, Scotch cambric, jaconet, and fine calico, besides muslin, crape, and gauze for particular flowers, and satin and velvet for thick petals, &c. Wax-flower-making is quite a distinct branch, and those who follow it claim with justice the title of artist. It will be treated under the head of WAX-FLOWERS.

The petals and sepals of the flowers, as well as the leaves of the plant, are stamped out by punches, or 'irons,' as they are technically termed. A large stock of these irons is necessary, as special forms and sizes are required for each flower. The next process in shaping is that of 'goffering,' or 'gauffering,' by means of which the hollow form is given to petals, and the midrib and veins of leaves imitated. For hollowing petals, the goffering-iron is simply a polished iron ball mounted on an iron wire in a handle. It is slightly warmed, and the petal is placed on a cushion, and the iron pressed against it. A variety of other forms of goffering-irons are used, such as prismatic rods, bent wires, &c. The venation of leaves is effected by dies made of iron or copper, which are nevertheless called goffering-irons.

The tinting of petals of the best flowers requires some amount of delicacy and skill. In nature, however, the tint of each petal of a flower is rarely uniform; and the best artificial flowers represent the natural variations with great accuracy. The petals of a rose, for example, are dyed by holding each separately by pincers, and then dipping it in a bath of carmine, and afterwards into pure water, to give delicacy of tint; but as the colour is usually deepest in the centre, a little more dye is added there while the petal is still moist, and this diffuses itself outwards in diminishing intensity. The whiteness at the insertion of the petal is produced by touching that part with pure water after the rest is dyed.

Leaves are cut and stamped in like manner from green taffeta, cambric, calico, &c. The glossy upper surface is represented by coating the taffeta, &c., from which they are stamped, with gum-arabic; and the soft tone of the under side is obtained by means of starch coloured to the requisite shade, and brushed on when of the right consistence to dry with the proper effect. A velvety texture is given by dusting the powdered nap of cloth, which has been previously dyed of the required colour, over the gummed leaf, the gum having been allowed to partly dry till it has become 'taccy.' The superfluous portion of nap is then shaken off. Buds are made of taffeta, tinted, and stiffened, and stuffed with cotton. Stamens are made of short pieces of sewing silk stiffened with gelatine, and when dry, the ends are moistened with gum, and dipped in flour, coloured yellow, to represent the pollen. Fine wire is sometimes used for the filament of the stamen.

The flower is built up from the centre; the pistil and stamens are tied in a bunch to a piece of wire; the petals are arranged in order, and pasted; then the sepals of the calyx are pasted outside of these, and further secured by winding fine thread or silk round the lower parts. Other wires are enclosed with this thread, and form the stalk, which is bound round with green tissue paper; and at proper intervals the leaves are inserted by means of fine wires, to which they are bound, the ends of these wires being bound in and incorporated with the stalk, and concealed by the green paper.

Besides the flowers copied from nature, there is a considerable demand for what are called 'fancy flowers,' most of which are invented by the manufacturer to use up waste and spoiled fragments originally designed for better purposes.

Flowers suitable for mourning are prepared by coating leaves, flowers, &c., with strong gum, and then dusting upon them powdered galena. This substance, a sulphuret of lead, is formed naturally in lustrous cubic crystals of a dark-gray colour, and however finely it is powdered, the fragments still tend to retain the same shape and surface, and thus present a number of flat glittering facets. It is used in like manner for cheap jewellery.

FLOWERS, in Chemistry, is a term originally given by the alchemists to the sublimates which rose, or appeared to grow from certain bodies capable of undergoing volatilisation when subjected to heat.

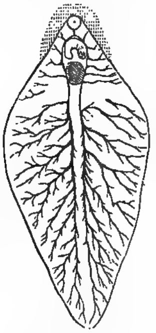
Thus, *flowers of antimony, flowers of arsenic, flowers of benjamin or benzoin, flowers of sulphur, flowers of zinc*, &c.

FLOX ÆRIS is a term applied to the suboxide or red oxide of copper.

FLUE. See Chimney.

FLUID. The mathematical definition of a fluid is, that it is a collection of material particles which can be moved among each other by an indefinitely small force. No fluid in nature strictly fulfils this definition, though very many do so sufficiently nearly to make the conclusions founded on the definition practically correct. Fluids are distinguished into elastic and inelastic—the former being those the volume of which is diminished by pressure, and increases when pressure is removed; the latter being those which have not this property, e. g., water and all those fluids termed Liquids (q. v.). Elastic fluids are also spoken of as compressible; and inelastic as incompressible—which, strictly speaking, no known fluid is, although all ordinary liquids are sufficiently nearly so to enable us to regard them as such without sensible error. See Vapours, Elasticity and Heat, Cohesion and Capillary Action.

FLUKE, the pointed triangular termination to each arm of an Anchor (q. v.).



Fluke-worm (*Distoma hepaticum*).

FLUKE, or **FLUKE-WORM** (*Distoma hepaticum*), an entozoon common in the liver and biliary ducts of ruminants, particularly of sheep, in which it produces the disease called *Rot*, often causing great mortality in flocks during wet seasons and on ill-drained lands. It receives its common name from its resemblance in form to the flounder, of which *fluke* is a Scotch and old English name. For a similar reason, it is sometimes called *Plaice*. It is a Trematode (q. v.) worm, higher in organisation than the cestoid worms, but not so high as the *Cœlelmintha*. It is generally not quite an inch in length, often much less, but sometimes more; of an oval form, its breadth about half its length; flat, in colour not very different from the liver in which it exists: it has no eyes nor other known organs of special sense; it is hermaphrodite, and the organs of reproduction occupy great part of its body, the ovaries being ranged along the margin; its anterior extremity is furnished with a sucker, and another is situated at a small distance on the ventral surface, whence the name *Distoma* (Gr. two-mouthed), but the terminal sucker alone is perforated, and serves as a mouth, by which bile—the food of the creature—is imbibed; the tube which proceeds from it not, however, becoming a proper intestinal canal, but soon dividing into two large branches, and ending in minute ramifications in all parts of the body. Prodigious numbers of flukes are sometimes found in the liver of a single sheep, and of very different sizes, but they are now believed not to multiply there as was formerly supposed. Their eggs, indeed, are produced there in great quantity, but find their way into the outer world to begin a series of transformations not yet very accurately traced with regard to this particular species, but of which the general nature is known. See Cercaria, Trematode Worms, and Generation, Alternation of. It seems that the young flukes, having entered as *Cercariæ* into the bodies of molluscs or of aquatic insect larvæ, are conveyed into the stomachs of ruminants feeding on herbage to which these are attached, and finding their way to the liver, there attain their full development. See Rot.

Instances have occurred of the presence of *Distoma hepaticum* in the human liver and *vena portæ;* as well as of a similar species, *D. lanceolatum;* a small species of the same genus, *D. heterophyes*, has been found in great numbers in the human intestines in Egypt, but its influence on the system is unknown; a species of much elongated form, *D. hæmatobium*, is very common in Egypt, infesting the *vena portæ* of man, and the walls of the urinary bladder, and producing local, and afterwards general disease; a small species, *D. ophthalmobium*, has been found in the human eye, but probably through some such accident as in another case has led to the occurrence of the common fluke under the skin of the foot, where it caused a sore. Of all the known species, the Egyptian, *D. hæmatobium*, is by far the most hurtful, as infesting the human body. This species is also remarkably different from the others, in not being hermaphrodite, and in the extreme dissimilarity of the male and female; the female being a thread-like worm, for which a lodgment is provided in a furrow (*gynæcophorus*) on the ventral surface of the male.

The genus *Distoma* or Fluke contains a great number of species, infesting, in their mature state, different kinds of animals, and finding their appropriate place in very different parts of the animal frame. The wrinkled membrane around the eyes of birds is the place of some.

FLUOR SPAR, a mineral which has been often described as chemically *Fluate of Lime*, a compound of fluoric (hydrofluoric) acid and lime, but which is in reality *Fluoride of Calcium* (CaF), consisting of 48·14 fluorine and 51·86 calcium (the base of lime). It occurs both crystallised and massive; the massive varieties exhibiting a crystalline structure; the crystals usually in groups, sometimes of the primary form, which is a cube, but often of secondary forms, of which there is great variety, as the octahedron, rhombic dodecahedron, &c. F. S. is sometimes colourless, but often green, blue, yellow, or red, more rarely gray, or even black; different shades of colour frequently appearing in the same specimen, and in the massive varieties beautifully intermixed. Its colours often rival those of the most beautiful gems; but it is of very inferior hardness, being scratched even by quartz. Its specific gravity is 3·14. It generally becomes phosphorescent when heated, although this is more remarkably the case with some varieties than with others; it is decomposed by heated sulphuric acid, with evolution of hydrofluoric acid as a pungent gas, which, having the property of acting upon and corroding glass, F. S. is used with sulphuric acid for etching on glass. F. S. is also used for ornamental purposes, being wrought into vases, &c., for which it was in high esteem among the ancients. But the greater abundance in which it is now obtained has diminished the value of ornaments made of it. It is very commonly associated with ores of tin, silver, lead, and copper, occurring chiefly in veins, but is also found by itself in drusy cavities in granite, greenstone, &c. It is found only in a few places in Scotland, and in insignificant quantity, but is nowhere more abundant than in England, particularly in Derbyshire and in Cornwall. In Cornwall, it is used as a flux for reducing copper ore. In Derbyshire, the blue massive variety is known to the miners as *Blue John*. The manufacture of ornaments of F. S. is carried on to some extent in Derbyshire. F. S. is often called Derbyshire Spar.

FLUORE′SCENCE is the term applied to a peculiar blue appearance exhibited by certain substances exposed to sunlight, and especially observable in a dilute solution of sulphate of quinine.

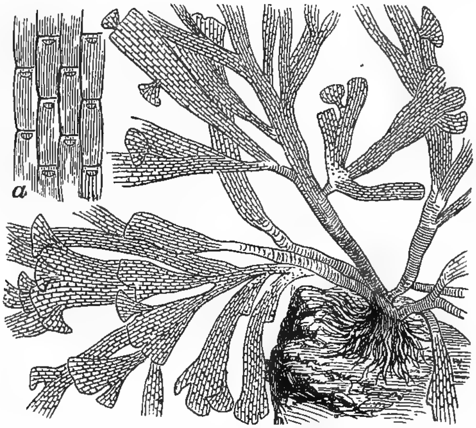
FLU′ORINE is an elementary substance allied to chlorine. Its principal natural source is the mineral, fluor spar (CaF), although it is also found in minute quantities in the igneous rocks, natural waters, plants, the bones and teeth of animals, as also in milk, blood, &c. Many attempts have been made to isolate fluorine, but these have all failed, owing to the extremely energetic nature of the substance, which causes it to unite with substances the moment it is liberated from a previous state of combination. Thus, if fluorine is evolved in glass, gold, platinum, or other metallic vessels, it immediately acts upon and unites with the material of the vessel, and ceases to be free and pure. It would appear, however, to be a gaseous substance, having the equivalent number 19, and with properties similar to chlorine, though differing in energy of action. The compounds of fluorine are not numerous, but are important. *Hydrofluoric acid*, or *fluoric acid* (HF), is generally prepared by heating gently in a lead still a mixture of one part of fluor spar (CaF) with two parts of sulphuric acid ($HOSO_3$), when the vapours of hydrofluoric acid (HF) are evolved, whilst sulphate of lime ($CaOSO_3$) is left in the still. The dense acid vapours are conducted through a lead pipe into a lead receiver or bottle, surrounded by a freezing mixture of ice and common salt. The acid is generally mixed with water when desired to be kept for some time. When the most concentrated hydrofluoric acid is required, the still and receiving vessel must be made of platinum. The other metals are not suitable for such apparatus, as they are rapidly corroded by the acid. When prepared in its strongest form, hydrofluoric acid has the density of 1060 (water = 1000), and is a colourless, fuming liquid of great volatility, which boils at 60° F., and does not freeze at −4° F. Not only does hydrofluoric acid corrode and dissolve the ordinary metals (excepting lead and platinum), but when placed on the skin, it produces a severe burn, owing to its caustic nature. The most important property which hydrofluoric acid possesses is its power of eating into and dissolving glass, which admits of its application in the etching of characters upon glass, as in thermometer tubes, and for eating away greater or less thicknesses of plates or sheets of coloured glass, so as to produce a variety of shades. See Glass-etching and Glass-staining.

FLUO′ROTYPE, a process in which salts of fluoric acid are employed for the purpose of producing pictures by the agency of light. It was suggested by Robert Hunt in 1844. Two solutions are prepared: one containing 20 grains of bromide of potassium to an ounce of water; and the other, 5 grains of fluoride of sodium to an ounce of water. These are mixed together just previous to using, and applied uniformly over the whole surface of good paper, which is then allowed to dry, and afterwards rendered sensitive by brushing over it a solution of nitrate of silver, sixty grains to an ounce of water. Papers so prepared may be used for the production of pictures in the camera or printing-frame; they require, however, to be intensified by development with protosulphate of iron, the reducing action of which should be regulated by the addition of acetic acid to the solution. The sensibility of the papers for camera-work may be much increased by brushing over them a weak solution of protochloride of tin previous to exposure.

FLUSH, a term used in the navy in reference to decks, which are said to be flush when extending without break on one level from the bow to the stern. Frigates and all smaller vessels of war (excepting a few steamers) are now constructed with flush upper-decks; but what are technically termed 'flush-decked ships,' are such as have all their guns on the upper-deck, as corvettes, sloops, brigs, and smaller vessels.

FLU′SHING (Dutch *Vlissingen*), a strong fortress and seaport of the Netherlands, in the province of Zealand, is situated on the south coast of the island of Walcheren, on the northern shore of the mouth of the Western Scheldt, in lat. 51° 26′ N., and long. 3° 36′ E. It is the most important naval station of the Netherlands, is well built, and has extensive dockyards. Its harbour is protected by two moles from the violence of the sea, with which, however, two canals within the town, sufficiently large and deep to allow of the largest merchant-vessels unloading at the quays, communicate. F., with the forts of Rammekens and Breskens in the vicinity, commands the entrance of the Scheldt. It is strongly fortified, and has important wharfs and arsenals. It also carries on a considerable commerce with India, England, and other countries. Pop. 10,000. F. is the birthplace of Admiral de Ruyter. It was stormed and taken by the English in the Walcheren expedition under Lord Chatham, in 1809.

FLU′STRA, a genus of zoophytes, of the class *Polyzoa* (or *Bryozoa*), and order *Infundibulata*, some of the species of which are very common on the British shores. The name is said to have been derived by Linnæus from the Saxon *flustrian*, to weave, because of the mat-like structure of the polypidoms, which in this genus are extremely plant-like, and by unscientific observers are generally regarded as belonging to the vegetable, and not to the animal kingdom. In some species, the polypidom assumes the appearance of a branching frond, with polype cells either on one side only, or on both sides; in others, it extends as an incrustation on rocks, shells, sea-weeds, &c. The polype cells are arranged quincuncially, and are in juxtaposition, more or less quadrangular, flat, and with a distinct border, which is sometimes furnished with teeth or short spines. The polypes have the power of moving either the whole head



Portion of Flustra Truncata (from Johnston's *Zoophytes*):
a, a few cells magnified.

at once, or the tentacles separately, and shew no little activity, so that a living F., seen through a magnifying-glass, is a most beautiful and interesting object. One of the most common British species is *F. foliacea,* which grows on hard ground in a few fathoms' water, and is continually to be found torn up by the waves, and scattered on the shore. It is an interesting fact, that the same species occurs in the Pacific Ocean.—A single square inch of *F. carbasea,* another common British species, has been found to contain 1800 cells; and as there are about ten square inches in an average polypidom, a single specimen may ordinarily contain about 18,000 polype heads.

FLUTE, one of the oldest wind instruments, well known to the ancient Greeks, has a soft and pleasant quality of tone, is an important instrument in orchestral music, and, in consequence of its easy treatment, is, in modern times, much in favour with amateurs. The flute is commonly made of boxwood or ebony, but sometimes of ivory or silver. Its form is that of a taper tube, made in four pieces, with six holes for the fingers, and with from one to fourteen keys, which cover or open other holes. The sound is produced by blowing from the mouth into the embouchure, an oval kind of hole at one side of the thick end, which is done by the lips covering a part of the hole, so that the air in its passage from the mouth is broken against the opposite edge of the hole, which causes the column of air inside the tube to vibrate. The notes of the gamut are produced by the opening or shutting of the holes by the fingers of both hands. The compass of the flute is from D to A sharp, nineteen diatonic intervals. For solo-playing, a flute with a compass from G to C is sometimes used. For orchestral purposes, there are also the *tierce* flute, the octave flute, the E flat and F piccolo flute; and the highest of all, the C piccolo. Improvements on the flute have been made from time to time by Quantz, Ribock, Trommlitz, and especially by Böhm in Germany, and by Rudell and Rose in London.

FLUTE-WORK, the name given to a particular class of stops in organ-building, in contradistinction to *reed-work.* There are also numerous stops in German organs, specially designated with the names of flutes of different kinds, of eight feet and four feet pitch, some of which have lately been introduced into English organs.

FLU'TING, the mouldings in the form of hollows or channels cut vertically on the surface of columns. These were adopted by the Greeks as ornaments to their Doric, Ionic, and Corinthian columns, and were retained by the Romans in their architecture. The Tuscan is the only style without flutes. In Doric (fig. 1), there are 20 flutes on the circumference, and the curves meet with a sharp edge. These curves are supposed, in Greek Doric, to be elliptical, and they are carried up across the necking to the base of the cap. In the other styles, there are 24 flutes on the circumference (fig. 2). These are semicircular, and are separated by a small fillet; and, before reaching the necking and the base, are terminated with semicircular top and bottom.

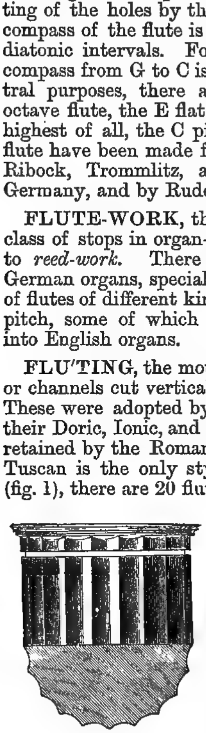


Fig. 1.

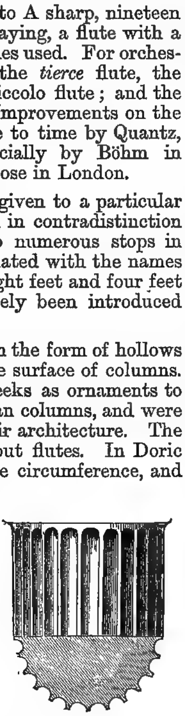


Fig. 2.

Flutes are said to be cabled when they are filled in to about ⅓ of their height from the base with a convex bead. This is done to strengthen the column and protect the flutes. In countries where Roman remains were abundant, as in the south of France, fluting was sometimes adopted by the early medieval architects, as at Arles and Autun. In Italy also, traces of this decoration are visible during the middle ages; but the flutes soon ceased to be vertical, and, in Romanesque Architecture (q. v.), assumed many varieties of forms, such as curves, zigzags, &c., twisting round the shafts.

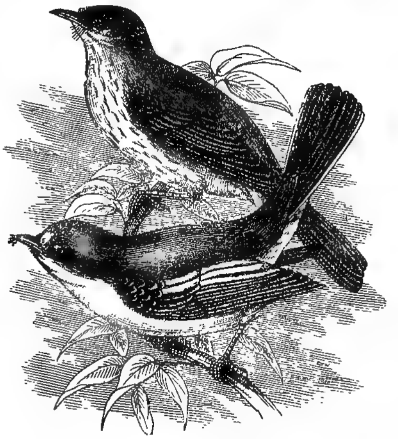
FLUX (*fluo,* I flow) is the term given to the substances employed in the arts which cause or facilitate the reduction of a metallic ore and the fusion of the metal. *White flux* is an intimate mixture of ten parts of dry carbonate of soda and thirteen parts of dry carbonate of potash, and is mainly instrumental in withdrawing the silica or combined sand from mineral substances; *black flux* is prepared by heating in close vessels ordinary cream of tartar (bitartrate of potash), when an intimate mixture of finely divided charcoal and carbonate of potash is obtained. The latter flux, when mixed with finely divided metallic ores, and the whole raised to a high temperature in a furnace, is not only useful in removing the silica, which the carbonate of potash it contains enables it to do, but the charcoal withdraws the oxygen from the metallic oxide, and causes the separation of the pure metal. Limestone is employed as the flux in the smelting of iron ores. The other fluxes are fluor spar, borax, protoxide of lead, &c. See IRON, COPPER, &c.

FLUX (Lat. *fluxus,* from *fluō,* I flow), a discharge, generally from a mucous membrane. The term is applied more or less frequently to all preternatural fluid evacuations from the body, but especially to those from the bowels, and from the uterine organs. Dysentery (q. v.) was long termed the bloody flux, to distinguish it from simple diarrhœa. Another scientific term for flux is Profluvium, which gives the name to a large order of diseases in Cullen's *Nosology.* See also CATARRH, MENSTRUATION, and, with respect to etymology only, RHEUMATISM.

FLUXIONS, in Mathematics. The method of fluxions invented by Newton was intimately connected with the notion of velocity uniform and variable; and extended that notion, derived from the consideration of a moving point, to every species of magnitude and quantity. It proposed to determine, in all cases, the rate of increase or decrease of a magnitude or quantity whose value depends on that of another, which itself varies in value at a uniform and given rate. If x and y represent two such quantities, and $y = F(x)$ represent the law of their dependence, and if $\dot{x}$ be supposed to be the velocity with which x increases, and $\dot{y}$ that with which y changes value. Newton undertook by his method to express $\dot{y}$ in terms of $\dot{x}$ and of x, or to find $\dot{y} = F_1(x) . \dot{x}$. The quantities x and y, which in modern language we call the variables, he called *flowing* quantities or *fluents,* and $\dot{x}$, $\dot{y}$, which we should represent by dx and dy, and call differentials, he called the *fluxions* of x and y. See CALCULUS. To illustrate his notation: suppose $y = x^n$, it may be shewn that $\dot{y} = nx^{n-1}\dot{x}$. Regarding now $\dot{y}$ as a quantity depending on x and $\dot{x}$, and supposing x to increase uniformly, in which case $\dot{x}$ is constant, and $\overset{\div}{(x)}$ its fluxion zero, we observe that $\dot{y}$ may have a fluxion, for it depends on the value assumed by $nx^{n-1} . \dot{x}$, when x further changes. We find $\overset{\div}{(\dot{y})} = n . (n-1) . x^{n-2} . (\dot{x})^2$. Thus, second fluxion or velocity of $\dot{y}$, or $\overset{\div}{(y)}$, Newton wrote $\ddot{y}$. If x had a second fluxion, or did not change uniformly, then that fluxion he wrote $\ddot{x}$. The third fluxion of y he wrote $\dddot{y}$; and so on, pointing as many points over the fluent as there are units in the order of the fluxion. For the fluent, he had no special symbol. Instead of $\int nx^{n-1}dx = x^n$, according to the modern notation, he wrote $\boxed{nx^{n-1} . \dot{x}}$, putting the expression in an enclosure. For the principles on which Leibnitz founded his calculus and its notation, see Calculus.

FLY, a popular name often given to insects of the order *Diptera* (q. v.) generally, sometimes extended to insects of other orders, and sometimes limited to the *Muscides* (q. v.). It is often used with a prefix, as house-fly, blow-fly, &c., to designate particular kinds of insects.

FLY-CATCHER (*Muscicapa*), a genus of birds of the order *Insessores*, tribe *Dentirostres*, and family *Muscicapidæ*, having a moderately long angular bill, broad and depressed at the base, compressed and slightly curved at the point; the base surrounded with hairs or bristles directed forwards, and which help to secure insect prey. The legs and feet are small; the outer toe the longest, and attached to the middle one as far as the first joint. The wings are not long; their first quill-feather is very short; the third is the longest. The birds of this genus, as now restricted, are exclusively confined to the Old World, and mostly to the warmer parts of it. Of the numerous North American birds often called fly-catchers, some belong to nearly allied genera, and others to genera not now ranked even in the same family. The true fly-catchers all have the habit—characteristic of many of the *Muscicapidæ* besides this genus—of remaining perched for a long time in the same spot, only leaving it to make a sudden dart at a passing insect, which is seized with a snap of the bill, and then returning. They are almost never to be seen running on the ground, or even on the branches of trees, and do not chase insects in the air like swallows. Only four species are European, two of which are British—the Spotted F. (*M. grisola*) and the Pied F. (*M. atricapilla* or *luctuosa*); birds about the size of a sparrow, the former of which is common in most parts of England, as a summer bird of passage, but rare in Scotland; the latter is rare in Britain, although abundant in the south of Europe. The spotted F. is brownish gray above, white beneath, the head and breast marked with dusky spots. Its voice is a mere chirp. It is remarkable for the choice it makes of situations for its nest, often on a beam in an outhouse, on the side of a fagot-stack, on the branch of a tree trained against a building, and sometimes even on a lamp-post in a street. Mr Durham Weir of Boghead, who was a diligent observer of the habits of birds, mentions that he witnessed a single pair of spotted fly-catchers feed their young no fewer than five hundred and thirty-seven times in one day, and that their motions were so rapid that he could not keep his eye off the nest for a moment.



Spotted and Pied Fly-catchers (*Muscicapa grisola* and *M. atricapilla*).

The name F. is often extended to other genera, and is sometimes used as co-extensive in signification with that of the family *Muscicapidæ*.

FLY-POWDER is the name given to a compound of metallic arsenic and arsenious acid, obtained by the partial oxidation of the metal, on exposure to air, and which is sold on the continent for the purpose of killing flies.

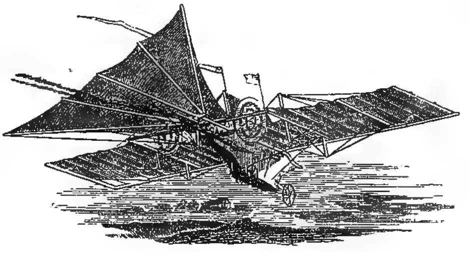
FLY-TRAP. See Dionæa.

FLYING, or **FLIGHT**, is the locomotion of an animal in the air, by means of *wings*, organs specially adapted to that purpose. By means of these organs, the animal raises itself from the ground and sustains itself in the air, as well as moves forward in any direction it desires. Birds and bats are the only existing vertebrate animals possessing the power of true flight; the lateral membranes of Flying Squirrels, Flying Lemurs, Flying Phalangers, and Flying Dragons, and probably even the great pectoral fins of Flying Fishes, serving only to sustain them in the air after the manner of a parachute, or at most to aid, on the principle of a boy's kite, in an oblique ascent. The extinct reptiles called Pterodactyles (q. v.) possessed, however, the power of true flight, as their remains sufficiently testify; and their wings were constructed on a plan as different from those both of birds and of bats as these (see Birds and Bats) are from each other. The wings in all vertebrate animals are the anterior limbs, and are thus homologous to the arms of man and the fore-legs of ordinary quadrupeds; in birds, the bones answering to those of the hand are much abbreviated and consolidated; in bats, they are prodigiously elongated; in pterodactyles, there was an elongation of a single finger. Among birds, although the power of flight is general, there are exceptions to the rule, the wings of some being merely rudimentary, and at most only helpful to them in running, those of others being adapted to swimming, not on the surface of, but under water.—The only invertebrate animals possessing the power of flight are insects; to the greater part of which vastly numerous class it belongs in their perfect state, although there are also many insects which are quite destitute of it, and this is sometimes the case with species very closely allied to others which possess it, nay, sometimes this great difference exists between the sexes of the same species. The wings of insects are not at all homologous to those of the flying vertebrata, although applied to the same use, and in structure are widely different from them all. See Insects.

In flying, the wings are made to beat or strike the air. The stroke in the one direction, however, must be very different from that in the other, or rather from that movement by which the wing is brought back to its place for another stroke. This difference is secured partly by greater force of muscular action, and consequent rapidity; the resistance of the air varying as the square of the velocity with which the wing moves in giving the stroke. But it is also secured partly by the conformation of the wing itself, the quill feathers of birds being so placed that they strike the air with their greatest extent of surface in the proper stroke of the wing, and *obliquely as it returns to its place.* An imitation of this is made in the rowing of a boat, and is called *feathering the oar.* The wings of bats, consisting of a membrane extended upon jointed bones, are probably in part folded up in order to the return from every stroke; and this is perhaps the case also with the wings of some insects, although those of others—as the Common Fly and the Bee—are certainly incapable of it; yet it is possible that even these may have a greater degree of rigidity communicated to them by the inflation of their air-tubes during the stroke than they have during the return.

Flying is analogous to swimming; but the difference of medium is very great, fresh water being about 800 times heavier than air, and the density of sea-water still greater. The bodies of animals intended for flight are therefore sometimes adapted to it partly by means which tend to diminish their proportionate weight, as the air-cavities in birds and insects; which, however, are still more important in relation to the increase of muscular power; and it is chiefly by the increase of muscular power that the power of flying is imparted. The exercise of strength requisite for swimming is comparatively small, about $\frac{1}{700}$th part only of that which is requisite for flying. How wonderful, then, the muscular power of birds capable of long-sustained flight, far exceeding in rapidity the speed of the swiftest locomotive engine ever constructed by man! or of insects, which in respect at least of rapidity, is in some species not inferior to that of the swiftest birds! The muscular power exerted in flying evidently differs very much both among birds and among insects. The large wings of some require also much less frequent muscular action, either to sustain the body in the air, to elevate it, or to move it forward, than the comparatively small wings of others. The motion of the wings of humming-birds and of insects is too rapid for the eye to follow.

It is not to be wondered at that projects of locomotion through the air have been much entertained by men, nor that, whilst the force of the objections already stated was unknown, artificial wings, and an imitation of the flight of birds, occupied the ingenuity of inventors. Grecian fable ascribes success to the mythic Dædalus (q. v.), who is said to have passed safely over the Ægean Sea on wings which he himself had made. More modern stories of similar success, although in far shorter flights, are numerous, but often resolve themselves, when carefully examined, into exaggerated accounts of feats performed on ropes, wings having been perhaps employed to render the exhibition more attractive, perhaps also to render the performance more easy by their extent of surface and resistance to the air. Other instances are on record of persons who, apparently by some parachute-like contrivance, descended obliquely from high towers to a considerable distance; as, in the 13th or 14th c., Elmerus, a monk, is said to have flown more than a furlong from the top of a tower in Spain, but the distance is probably much exaggerated; and in the 17th c., Besnier, a locksmith of Sable, in France, who prudently began from windows one story high, ventured at last and safely to leap from very elevated positions, and so passed over houses or over rivers of considerable breadth. All these, however, were mere feats destitute of utility, although they encouraged the expectation of better results, which was cherished by some of the most scientific men of that period. Bishop Wilkins, in particular, devoted much attention to this subject. Perceiving the inadequacy of the human arm and the muscles which move it to give sufficiently rapid motion to wings of sufficient size, he suggests that 'it were therefore worth the inquiry to consider whether this might not be more probably effected by the labour of the feet, which are naturally more strong and indefatigable.' So confident was he of success, that he anticipated the time when a man should as readily call for his wings to make a journey, as he then did for his boots and his horse. More recently, in the end of the 18th and beginning of the 19th c., Sir George Cayley occupied himself with speculations and experiments on this subject. Acknowledging the difficulty which arises from the want of muscular strength in man, he says: 'It is only necessary to have a first mover, which will generate more power in proportion to its weight, than the animal system of muscles.' But this first mover has not hitherto been found. The employment of steam for this purpose has been frequently proposed. Attempts of this kind, however, have rather for their object aërial navigation than artificial flying, properly so called; although the inventions have been variously designated aërial ships, flying machines, &c. A great difficulty has been found in the weight of the steam-engine and its fuel; and experiments which have cost no small sums, and have excited not a little of public attention, have signally failed through miscalculation on this essential point. Not unfrequently, attempts have been made to combine some modification of the balloon with the steam-engine or other means of propulsion. In no instance, hitherto, has there been the least approach to success, although a *European Aëronautical Society* was formed, and issued its advertisements in 1835; and about eight years afterwards, an *Aërial Transit Company* not only amused the public for a considerable time, but obtained the assent of the British House of Commons to a bill for its constitution. Models have sometimes been exhibited of aërial machines capable of being guided at the pleasure of the aëronaut, in a perfectly still atmosphere, but nothing has yet been invented capable of serving any practical or useful purpose. There is, however, nothing evidently contrary to science or sound philosophy in proposals for aërial navigation, which, in this respect, differs widely from human or artificial flying.



Flying Machine, invented by Mr Henson, 1843.

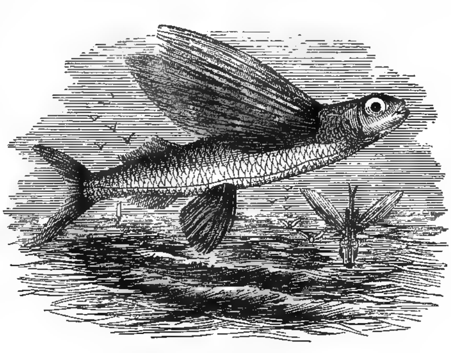
Perhaps the *aëronautic fish,* on which Marshal Ney is said to have spent 100,000 francs, and which for a considerable time occupied the attention of some of the most ingenious and scientific men in France, deserves particular notice. It was a large balloon, of a long fish-like figure, intended to swim in the air, as a fish in water, and to be propelled by wings or fins working by cranks; an oblique upward direction was to be given to its motion, by a weight placed near the tail; a downward direction by the same weight hauled forward to near the head. But when launched, although it floated and moved forward a little, it turned on one side, and this tendency could not be corrected, so that the experiment proved a complete failure. For further information, see *Chambers's E. Jour.*, No. 227. N. S.

FLYING BRIDGE. See Ferry.

FLYING DRAGON, or FLYING LIZARD (*Draco*), a genus of saurian reptiles, allied to iguanas and stellions, but remarkably distinguished from them, and indeed from all other reptiles now existing, by lateral membranes which support them in a parachute-like manner in the air, and enable them to pass from tree to tree, even to considerable distances. These membranes are supported on the first six false ribs, which, instead of encircling the abdomen, stand out at right angles from the body for this purpose. They are incapable of the movements requisite for true flying; when not in use, they are folded close to the body. There is also in the flying dragons an inflatable pouch under the chin, sustained partly by the hyoid bone and partly by two small bones. The tail is long. The scales are small and imbricated; those of the tail and limbs are keeled. The tongue is extensile, but not greatly so. All the species are of small size, live among the branches of trees, and feed on insects. They are natives of the East Indies. The genus is subdivided by some naturalists. One of the species is figured in the article Dragon.

FLYING FISH, a name given to all those fishes which have the pectoral fins so very large that by means of them they are sustained in short seeming flights in the air. These fishes belong to two very different families—*Scomberesocidæ* and *Sclerogenidæ;* but the name F. F. is sometimes limited to those of the former family, the genus *Exocœtus;* those of the latter being known as *Flying Gurnards.* The genus *Exocœtus* has the pectoral fins nearly as long as the body, the dorsal fin placed over the anal, the tail forked, and its lower division considerably larger than the upper. It is subdivided by some naturalists into several genera, characterised by the presence or absence of barbels, &c. Two species have occasionally been seen near the British shores, one of which (*E. volitans*) is very abundant in the warmer parts of the Atlantic Ocean, the other (*E. exiliens*) is common in the Mediterranean. In the former, the ventral fins are situated far forward, and are short; in the latter, they are situated far back, and are considerably elongated. More than thirty species are known, all inhabiting the seas of the warmer parts of the world, and having their respective geographical limits pretty exactly defined.

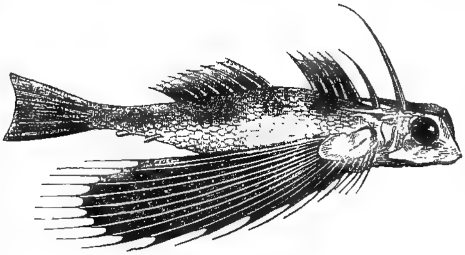
They swim in shoals; and whole shoals—varying in number from a dozen to one hundred or more—often leave the water at once, darting in the same direction through the air, and after descending into the water at a distance of two hundred yards, or even more, from the place where they arose, quickly renewing their flight. These flights of flying-fishes form one of the most interesting and pleasing spectacles which relieve the monotony of a voyage in the tropical seas. Sometimes, the coryphene (dolphin) may be seen in rapid pursuit, taking great leaps out of the water, and gaining upon his prey, which take shorter and shorter flights, vainly try to escape by doubling like the hare, and sink at last exhausted: sometimes the larger sea-birds catch flying-fishes whilst they are in the air; but it does not seem to be at all true that these fishes leave the water, as has been very generally imagined, merely to escape from danger, nor is there any good reason for that sentimental pity which has been often expressed with regard to them, as creatures harassed and persecuted more than others, and peculiarly exposed to dangers both in the sea and in the air. They seem rather to exercise their powers, like other creatures, very often merely from the delight which they take in the exercise of them, and from the exuberance of their happiness.—The question, whether or not the flying fishes use their pectoral fins at all as wings, cannot yet perhaps be considered as completely decided; some observers, well entitled to respect, maintain that they do, although, of course, their power of flight is limited to the time that the fins remain quite moist; but a great preponderance of testimony is in favour of the opposite opinion, which regards the fins as acting merely after the manner of a parachute or of a kite. Flying fishes sometimes rise to a height of twenty feet above the water, although they more frequently skim along nearer to its surface. They often fall on the decks of ships. They are good food, and the natives of the South Sea Islands take them by means of small nets attached to light poles, like those in which anglers catch minnows for bait. For this purpose, they go out at night in canoes, to the outer edge of the coral reefs, with a torch, which enables them to see the fishes, and perhaps both attracts and dazzles them.



Flying Fish (*Exocœtus volitans*).

FLYING FOX. See Kalong.

FLYING GURNARD (*Dactylopterus*), a genus of fishes of the family *Sclerogenidæ* or Mailed Cheeks, nearly allied to the Gurnards (*Trigla*), but remarkably distinguished by the great size of the pectoral fins, which they use for the same purpose and in the same way as the *Exocœti.* See Flying Fish. The pectoral fins are, however, of a very different appearance from those of the *Exocœti,* widening almost to the end, which is rounded, and the tips of the rays extending considerably beyond



Flying Gurnard (*Dactylopterus volitans*).

the membrane. A very long spine rises from the back of the head. One species (*D. volitans*) is common in the Mediterranean, and is sometimes fifteen inches in length. Its flight is said not to extend to more than about forty yards, but it sometimes rises high enough to fall on the decks of large ships. 'At particular times, especially on the approach of rough weather, in the night, numbers of them may be seen, by the phosphoric light which they emit, making their arched passages in apparent streams of fire.'—Another species inhabits the Indian seas. —Some species of *Apistes*, belonging to the same family, have similarly large pectorals, and make similar flights.

FLYING LEMUR, or **COLUGO** (*Galeopithecus*), sometimes also called FLYING CAT and FLYING FOX, a genus of mammalia, generally regarded as constituting a distinct family, *Galeopithecidæ*, which, by some naturalists is placed, as by Cuvier, among the *Cheiroptera* (see BAT), although it is now more commonly associated with the Lemurs (q. v.), as by Linnæus. There are, indeed, evident affinities both to lemurs and bats, but chiefly to the former, with which the osteological and other anatomical characters generally agree. Along the sides extends an ample membrane or fold of the skin, beginning behind the throat, and including both the fore and hind legs as far as the toes, but leaving them free, and further stretched along both sides of the tail to the tip. In the last particular, it differs from the lateral membrane of the flying squirrels and flying phalangers, and more resembles that of bats; but it widely differs from that of bats in being comparatively thick, and covered on both sides with short thick hair; and still more in leaving the fore-feet free, and not being stretched on lengthened finger-bones. Nor can it be used for true flight, but only to support the animal in the air like a parachute, enabling it to take enormous leaps of one hundred yards or thereby in an inclined plane. It is not yet satisfactorily determined whether the differences to be observed between the specimens of flying lemurs in collections, are to be regarded as differences of species or of variety. Attempts have been made to distinguish several species, but it is difficult on account of their great similarity. They are from twenty inches to two feet in total length, are natives of the Indian Archipelago, inhabiting lofty trees in dense forests, and feeding on small birds' eggs and fruits, as well as on insects. They are nocturnal in their habits. They are very inoffensive, and scarcely attempt to bite even when seized. Their voice resembles the low cackling of a goose. They produce generally two young ones at a birth. The Pelew islanders greatly esteem them as food, but they have a rank unpleasant smell.

FLYING PHALA'NGER, or **FLYING OPO'SSUM** (*Petaurus*), a genus of marsupial quadrupeds, containing several species, natives of New Guinea and of Australia, where they are generally called Squirrels or Flying Squirrels. They are nearly allied to the Phalangers (q. v.), which they particularly resemble in dentition, but have not the tail so long and prehensile, whilst they are distinguished by a hairy membrane or fold of the skin extending along the flanks, and used as a parachute to enable them to leap to great distances. This membrane extends along both fore and hind legs almost to the toes, but does not appear behind the hind legs, nor include the tail, which is pretty long and bushy, but which in some of them has a *distichous* character, the hair spreading out to the sides, and so rendering it useful in supporting as well as in guiding the body in the air. They are capable of modifying their course in the air, although not of true flight; and their aërial evolutions are very graceful. They repose during the day, and become active in the evening. They feed on fruits, leaves, insects, &c. A New Guinea species is about as large as a flying lemur; one of the Australian species is scarcely larger than a mouse. The fur of some of them is rich and beautiful.—PETAURIST has been proposed as an English name for this genus; but is not much used.

1, Flying Phalanger (*Petaurus Taguanoides*); 2, Flying Mouse (*Petaurus Pygmæus*).

FLYING SQUID (*Ommastrephes*), a genus of cephalopodous molluscs, allied to the Calamaries (q. v.) or squids, but differing from them in having the eyes exposed and not covered with skin, the fins united into one as a tail, and the *gladius* or bone furnished with three diverging ribs and a hollow conical appendage. The tail is large, and the power of locomotion great, so that these molluscs not only pass rapidly through the water, but leap out of it, and high enough sometimes to fall upon the decks of ships. They form a principal part of the food of many of the *Cetacea*, and are often the prey of albatrosses, petrels, and other marine birds. They are used as bait for cod in the Newfoundland fisheries.

FLYING SQUIRREL (*Pteromys*), the name given to a considerable number of species of the Squirrel family (*Sciuridæ*), which have a fold of the skin of the flanks extended between the fore and hind legs, and partly supported by bony processes of the feet, by means of which they are enabled to take extraordinary leaps, gliding for a great distance through the air. The tail also aids to support them in the air, as well as to direct their motion, its hairs extending laterally 'in a sort of feathery expansion.' The dentition is similar to that of true squirrels, with which also the habits generally correspond. One species (*P. Sibiricus*) is found in the north of Europe and of Asia; several species are natives of North America, and others inhabit the south-east of Asia and the Indian Archipelago. The European species is about the size of a rat, grayish-ash colour above, white below, the tail only half the length of the body; it lives solitarily in the forests. Its fur is of little value, but skins are sometimes mixed with those of the gray squirrel, to impose on the purchaser. The most common North American species (*P. volucella*), abundant from the Gulf of Mexico to Upper Canada, is fully five inches long, with a tail of five inches additional, fur included. It is of a brownish-gray colour above, white beneath; a black line surrounds the orbit of each eye. All the species inhabit woods, and the night is their time of activity. They feed not only on nuts and young shoots of trees, but also on small birds. They are extremely easy of domestication.

Flying Squirrel (*Pteromys volucella*).

In gliding from tree to tree, the common American flying squirrel descends obliquely and with very rapid motion, until near the tree which it seeks to reach, when it wheels upwards, and alights at about a third of the height which it was from the ground on the tree which it left, the distance between the trees being perhaps fifty feet.

FLY-WHEEL, a large heavy wheel applied to a steam-engine or other machinery in order to equalise the effect of the moving power. Its action depends upon the principle, that a body once set in motion retains a certain amount of moving force or *momentum*. This increases with the weight of the body and the velocity of its motion, and may be expressed relatively by multiplying the weight by the velocity; or stated otherwise, the force required to destroy the motion of a body is equal to that which set it in motion. Thus, a heavy wheel becomes a sort of reservoir of force, when set in motion.

There are two principal cases in which the fly-wheel is commonly applied: first, when the motive power is intermittent or irregular; and second, when the resistance or work to be done is intermittent or irregular. The crank is a good example of the first case. If the force be applied only downwards, as in the common foot-lathe, it will be intermittent, and the crank must rise independently of the prime mover. This is effected by applying a fly-wheel, which is set in motion by the descending pressure of the foot acting upon it through the crank; and the momentum it has thus acquired lifts the crank again to the point where it can be acted upon by the foot. It also carries the crank over the *dead points* (see CRANK), where even a double action of pulling and pressing would be ineffective. The case of a steam-engine turning a long shaft which passes through several workshops, and by means of bands drives a number of lathes, punching, drilling, planing machines, &c., is a common example of the second case, the resistance or work to be done being very variable from one moment to another. In such work as that of a punching-machine, the engine need not be nearly of sufficient power to directly force the punch through the metal, and yet by the aid of the fly-wheel it may do it; for while the punch is rising, the engine is communicating momentum to the fly-wheel; and when the descending punch meets with the resistance it has to overcome, this reserved momentum is added to the direct power of the engine, the punch is forced through, and the speed of the fly-wheel slackened, in proportion to the resistance.

The principle of the fly-wheel is sometimes applied in other forms than that of a wheel, as in the hand-coining press, where a heavy ball is fixed at each end of a long lever, which is made to swing round with considerable velocity, and the accumulated momentum is concentrated upon the blow.

FO. See BUDDHA.

FO'CHABERS (of old, *Fochobyr*, and still locally styled *Fochaber*), a small, neat village and burgh of barony on the right bank of the Spey, in Morayshire. Pop. about 1500. The parish church stood formerly at Bellie, in Banffshire, about two miles nearer Speymouth, and in the immediate neighbourhood of an old encampment, which has been supposed to be the Tuessis of Ptolemy. Gordon Castle, the old 'Bog of Gight,' formerly the seat of the Duke of Gordon, now of the Duke of Richmond, stands between F. and a bridge across the Spey, built about the year 1803, partly destroyed by the flood of 1829, and since partly rebuilt in wood. The site of F. is peculiarly fine, lying as it does at the mouth of a picturesque ravine, watered by a mere rill falling into the rapid Spey, but swelling in times of flood into a wider stream than that which it feeds.

FOCI'METER. See CLAUDET'S FOCIMETER.

FOCUS. Certain points in the ellipse, hyperbola, and parabola are called foci. See ELLIPSE, HYPERBOLA, and PARABOLA. Focus, in Optics, is a point in which several rays meet and are collected after being reflected or refracted, while a *virtual* focus is a point from which rays tend after reflection or refraction. The principal focus is the focus of parallel rays after reflection or refraction. See LENS, MIRROR, and CATOPTRICS and DIOPTRICS.

FODDER (Ger. *futter*, Anglo-Sax. *foddor*), the food collected by man for the use of the domestic herbivorous quadrupeds. In English, the term is commonly restricted to dried herbage, as hay and straw; but in other languages, it is more comprehensive, and includes all the food of cattle, except what they gather for themselves in the field.

The principal part of the food of all the domestic herbivora is furnished by grasses, almost all of which are eaten by them when fresh and green. Besides the supplies which they receive of all the kinds of corn cultivated for human food, they are also, to a considerable extent, dependent on the *straw* or dried herbage of the corn-plants for their winter provender; and that of many other grasses, cultivated on this account alone, is converted into *hay* for their use. Hay, being cut and rapidly dried whilst the plant is still full of sap, contains more nutritious matter than the ripened straw of the cereals. The most important fodder grass of Britain is RYE GRASS, next to which must be ranked TIMOTHY GRASS; but all the meadow grasses and larger pasture grasses also contribute to the supply of hay.

Next to the grasses must be ranked different kinds of *Leguminosæ*, affording food for cattle in their seeds—as beans, pease, lentils, lupines, &c.—and in their herbage, on account of which many of them are cultivated, as clover, medick, melilot, vetch, tare, sainfoin, &c., of some of which there are numerous species. Some of these also often enter pretty largely into the composition of hay, being cut and dried with the grasses along with which they have been sown; which is the case also with some plants of other orders, as the Ribwort Plantain, &c. Some of the *Cruciferæ* are cultivated to a considerable extent as forage-plants, cattle being fed on their green herbage, although they are not suitable for drying as fodder. Among these are kale and cabbage, rape, &c.

In some parts of the world, cattle are not unfrequently fed on the leaves of trees, as in the Himalaya, where the leaves of different species of *Aralia*, *Grewia*, Elm, and Oak, are chiefly employed for this purpose, and are collected, dried, and stacked for winter fodder.

Roots, although not fodder in the English sense, must here also be mentioned as constituting a large part of the food provided for cattle, particularly those of the potato, turnip, mangold, and carrot, and to some extent also those of the parsnip and Jerusalem artichoke.

FODDER, in Law. It is generally considered to be implied in the rules of good husbandry that the hay and straw produced by the farm shall be consumed on it. In England, 'in the absence of any agreement respecting the removal of hay and straw, the right to do so is regulated by the custom of the country.'—Woodfall, p. 537. The custom differs not only in different counties, but in different parts of the same county. In the narrower sense of fodder, in which it is used to signify hay or straw that has been already used for bedding cattle, or the like purpose, there seems to be no question that it must be retained on the farm. 'Whatever question there may be with respect to hay and straw, as before noticed, all the litter, *fodder*, dung, manure, and compost, must invariably be consumed on the lands; indeed, if this is not expressly provided for by the terms of the contract, it is always implied, as a removal would clearly be a breach of good husbandry.'—*Ib.* Where the outgoing tenant leaves fodder on the premises, he is entitled to no compensation, except under an express stipulation. In Scotland, where the rules of good husbandry are more strictly attended to, the tenant must consume the whole of the fodder produced by his lands, except the hay and straw of his outgoing crop, and the same rule is applicable to assignees and subtenants. In some counties, fodder used for making dung is considered Steelbow (q. v.), and given to the incoming tenant; but this is usually regulated by express stipulation in the lease. 'At one time,' says Mr Hunter, 'it was held that a tenant had a right to dispose of the straw of the away-going crop, although the lease bore a general clause, binding him to consume the straw on the farm during the lease. But the rule now is, that where there is an express stipulation that all the manure, hay or straw, shall be used or left, it is strictly interpreted, without control from local usage; and the tenant is not entitled to take away or sell, or have value for the straw of the last or away-going crop.'—*Landlord and Tenant*, ii. p. 461.

FŒ'TUS, the term applied in Medicine to the mammalian embryo, especially in its more advanced stages. In the human subject, we usually speak of the embryo at and after the end of the fourth month as a fœtus.

There are several points in relation to the fœtus which are of great interest both to the physiologist and to the medical jurist. It is frequently of great importance in medico-legal inquiries to be able to ascertain the *age* of the fœtus; and to facilitate such determination, the physical characters which it presents at different ages have been carefully noted and described.

In the fœtus of nine months—the full term—the length is from 17 to 21 inches; weight from 5 to 9 lb., the average being about 6½ lb. Even at birth, the average length and weight of the male infant slightly exceeds that of the female. From numerous observations made by Quetelet, it appears that there is an average excess of length of 4·8 lines, and of weight of twelve ounces, in the male infant.

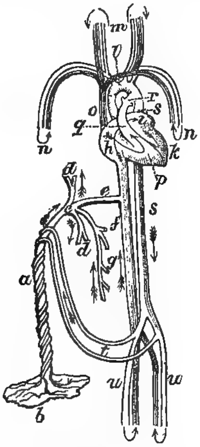
The average weight of infants, without regard to sex, was found by a French observer, Chaussier (who noted the weight in more than 20,000 cases), to be about 6·7 lb.—the maximum being 11·3, and the minimum 3·2 lb. From the inquiries of Dr Joseph Clark (*Philosophical Transactions*, vol. 76), which were made on 60 males and 60 females, the average in this country seems rather higher, the weight of males being 7 lb. 6 oz., and that of the females being nearly 6 lb. 12 oz.; and Professor Simpson has arrived at very nearly the same result. Clark observes that if, at the full time, the weight of the infant is less than 5 lb., it rarely thrives. Various instances are recorded of infants in which the weight at birth has exceeded twice the average weight. Thus a case is recorded by Mr Owen, in the *Lancet* for 1838, in which the child at delivery weighed 17 lb. 12 oz., and was 24 inches in length; and in the *Medico-Chir. Review*, October 1841, there is the mention of a case in which the weight was nearly 18 lb.

There are certain points in which the fœtus at the full period differs anatomically from the child shortly after birth. The bony skeleton is very incomplete, cartilage occurring in the place of many bones. Indeed, complete ossification (viz., of the vertebræ) is not finished until about the 25th year, and the only bones completely ossified at birth are the minute ossicles of the ear. The difference between the fœtus and the child in this respect is, however, only one of degree.

During pregnancy, a temporary organ, termed the placenta (popularly known as the after-birth, from its being thrown off shortly after the birth of the child), is developed on the inner wall of the uterus (see *b* in the figure). This organ is mainly composed of vessels, and there proceeds from it the structure known as the umbilical cord, *a*, in which lie the umbilical vein, which conveys arterial blood to the fœtus, and the two umbilical arteries, which return the blood to the placenta. This umbilical cord conveys these vessels to the umbilicus, or navel. Before tracing the course of the blood through the fœtus, we must notice the chief anatomical peculiarities presented by the vascular or circulating system before birth.

1. In the heart, we find a communication between the two auricles by means of an opening termed the *foramen ovale.* 2. In the arterial system, we have to notice first, the *ductus arteriosus* (see *r* in the figure), which is a large communicating trunk between the pulmonary artery and the descending aorta; and, secondly, the branches given off by the internal iliac arteries, which go under the name of hypogastric as long as they are within the body of the fœtus, and of umbilical when they enter into the structure of the cord, are continued from the fœtus to the placenta, to which they return the blood which has circulated in the fœtal system. 3. In the venous system there is a communication between the umbilical vein and the inferior vena cava, called the *ductus venosus.*

Pure blood is brought from the placenta by the umbilical vein, which passes through the umbilicus, and enters the liver, where it divides into several branches, *d*, *d*, which are distributed to that viscus, the main trunk or *ductus venosus*, *e*, passing directly backwards, and entering the inferior vena cava, *f*. The pure blood here becomes mixed with the impure blood which is returned from the lower extremities and abdominal viscera, and is carried into the right auricle, *h*, and from thence, guided by the Eustachian valve (which is situated between the anterior margin of the inferior cava, and the auriculo-ventricular orifice, and is of relatively large size in the fœtus), passes through the *foramen ovale*, into the left auricle, *i*. From the left auricle, it passes into the left ventricle, and into the aorta, whence it is distributed by the carotid and subclavian arteries principally to the head and upper extremities, which thus receive comparatively pure blood. From the head and arms, the impure blood is returned by the superior vena cava to the right auricle; from the right auricle, it is propelled, as in the adult, into the right ventricle; and from the right ventricle, into the pulmonary artery. In the adult, it would now pass through the lungs, and be oxygenised; but in the fœtus, it passes through the *ductus arteriosus* into the commencement of the descending aorta, where it mixes with that portion of the pure blood which is not sent through the carotid and subclavian arteries. Some of this mixed blood is distributed by the external iliac arteries, *u*, *u*, to the lower extremities, while the remainder (probably the larger portion) is conveyed by the hypogastric or umbilical arteries, *t*, to the placenta.



The Fœtal Circulation (from Wilson's *Anatomist's Vade Mecum*):

a, the umbilical cord proceeding from *b*, the placenta; *c*, the umbilical vein; *d*, *d*, its branches going to the liver; *e*, the *ductus venosus; f*, the inferior vena cava; *g*, the portal vein; *h*, the right auricle. The uppermost arrow indicates the course of the blood through the *foramen ovale*. *i*, the left auricle; *k*, the left ventricle. The arrow commencing in the left ventricle, and with its head on the ascending aorta, indicates the course of the blood to be distributed to the head and extremities; *l*, the arch of the aorta. The arrows *m* and *n* represent the return of the blood from the head and upper extremities, through the jugular and subclavian veins, to the superior vena cava, *o*, to the right auricle, *p*, and, as shewn by the arrow, through the right ventricle, *k*, to the pulmonary artery, *q*; *r*, the *ductus arteriosus; s*, *s*, the descending aorta; *t*, the hypogastric or umbilical arteries; *u*, *u*, the external iliac arteries.

From the above description we perceive—1. That a considerable quantity of the pure blood from the placenta is at once distributed to the liver, which accounts for its large size at birth as compared with the other viscera. 2. That a double current meets in the right auricle, one stream, guided by the Eustachian valve, passing through the *foramen ovale* into the left auricle, the other through the auriculo-ventricular opening into the right ventricle. 3. That the comparatively pure blood sent to the head and arms, as contrasted with the impure blood sent to the lower extremities, causes the relatively greater development of the former organs, and prepares them for the functions they are called upon to perform; the development of the legs at birth being slight as compared with that of the head or arms.

Almost immediately after birth, the *foramen ovale* becomes closed by a membranous layer, and the *ductus arteriosus* and *ductus venosus* degenerate into impervious fibrous cords.

The lungs, previously to the act of inspiration, are dense and solid in structure, and of a deep-red colour, and lie far back in the chest. Their specific gravity is greater than water, in which they (or portions of them) consequently sink, whereas lungs, or portions of lungs, that have respired, float in that fluid.

In the preceding remarks, we mentioned *nine months* as the full period of fœtal existence. The period of gestation is, however, only constant between certain limits, and it is of the greatest importance in reference to questions of chastity and legitimacy to determine these limits.

The average duration of gestation in the human female is comprised between the 38th and 40th weeks after conception. It is comparatively seldom that the actual date of conception can be fixed with positive certainty; but amongst the few cases of this kind on record, Rigby mentions one in which natural labour came on in 260 days, and Reid mentions another in which it did not commence until the lapse of 293 days. Here, then, we have an unquestionable range of 33 days; and many apparently authentic cases are on record in which a longer period of gestation than in Reid's case has been observed.

Another important question in connection with this subject, is—What is the earliest period at which a child can be born, to enable it to live, and to continue in life after its birth? There is no doubt that children born at the seventh month of gestation are capable of living, although they usually require much care; and children may be born alive at any period between the sixth and seventh months, or even in some instances earlier than the sixth; but this is rare, and if born living, they commonly die soon after birth. Various cases of this nature are collected by Dr Taylor in his *Medical Jurisprudence;* amongst others, he mentions a case reported by Dr Barker of Dumfries, in which a child was born at the 158th day of gestation, and (though small) grew up. In the celebrated Kinghorn case, the child was born 174 days, or nearly six calendar months after marriage, and lived for more than eight months; and the majority of the medical witnesses who gave evidence on that occasion were strongly in favour of the view that the period of the gestation was circumscribed by the period of wedlock.

Again, questions connected with prolonged gestation have given rise to much discussion in legal medicine. No period has been fixed by law beyond which a child if born in wedlock is to be declared illegitimate. In the case of Anderton *v.* Gibbs, 1834, the vice-chancellor decided that a child born ten months or about forty-two weeks after intercourse with the husband, was legitimate. In the Gardner Peerage case, which came before the House of Lords in 1825, the question was, whether a child born 311 days (or 44 weeks and 3 days) after intercourse could be legitimate. Lord and Lady Gardner separated on the 30th of January 1802, and did not again meet till the 11th of July. A full-sized child was born on the 8th of December of that year. The principal obstetric practitioners in the kingdom were examined on this point, and a large majority concurred in the opinion that natural gestation might be protracted to such a period. The decision, which was against the legitimacy, seems to have been mainly if not entirely based on the moral grounds that Lady Gardner, after separating from her husband, was living in open adultery. In the case of Commonwealth *v.* Porter (see *American Journal of Medical Science*, 1845), it was recently decided in the United States that a child born 317 days (or forty-five weeks and two days) after conception was legitimate. In the case of Cotterall *v.* Cotterall, decided in the Consistory Court in 1847, the husband had proceeded against his wife for a divorce on the ground of adultery. In this case, if it were the child of the husband, it must have been born after twelve months' gestation. Dr Lushington, without entering into the question of protracted gestation, at once pronounced for the divorce, such a duration of pregnancy not being supported by any known facts.

This article would be imperfect without a notice of the question—What constitutes live-birth? This is a point on which the most distinguished obstetric authorities have differed: some holding that where there is muscular movement, there is life; while others maintain that where respiration has not been proved to have taken place, the child was still-born. Amongst the most celebrated lawsuits bearing on this point, we may mention that of Fish *v.* Palmer, tried in 1806, and that of Brook *v.* Kellock, tried in 1861. In the last-named case it was decided by the Vice-Chancellor, Sir J. Stuart, that a child may live for some time after birth, and not breathe, the absence of signs of breathing being held to be no proof of its being born dead. It was given in evidence that there was pulsation of the funis after separation of the cord, and the beating of the heart was regarded as proof of live-birth. Hence we may regard it as now established in English law, that respiration is not required to establish live-birth. Nor do the laws of France or the United States require that the child shall have breathed. In Scotland, the law requires not only that the child shall have breathed, but that it shall have cried; and in conformity with this law, a child which lived, breathed, and died in convulsions at the end of half an hour, was declared to have been born dead (Dyer's *Reports*, 25).

FOG, or **MIST**, is the visible watery vapour sometimes hanging near the surface of the earth, and caused, as clouds are, by the precipitation of the moisture of the atmosphere. This takes place when a stratum of atmosphere comes in contact with a colder stratum, or with a portion of the earth's surface, as a hill, by which it is cooled, so that it can no longer hold in solution as much moisture as before. It takes place also when a cold stratum of atmosphere comes above a moist warm portion of the earth's surface, the exhalations from which are precipitated and become visible as they ascend into it. Thus, fogs are formed over lakes, rivers, and marshes in the evening, because the water is then warmer than the atmosphere above it. The fogs seen in the morning very often disappear by being dissolved in the atmosphere as the temperature increases.

FOGARASY, JÁNOS (John), a Hungarian philologist and jurisconsult, was born in 1801 at Käsmárk, in the county of Abanj. F. went through the study of philosophy and law at the Calvinistic college of Sárospatak, and was called to the bar in 1829. Upon entering the judicial career, F. divided his exertions between law and the national or Magyar language, with such success that he was elected Fellow of the Hungarian Academy in 1838. F.'s several publications in the fields of Hungarian jurisprudence and philology are reckoned to be standard works, bearing the stamp of deep original research, and of great systematic powers. The following list of works, all published at Pesth, in the Hungarian or Magyar tongue, may shew the fertility of F.'s pen: *Latin-Magyar Lexicon for Legislation and Government* (2d ed. 1835); *The Metaphysics of the Magyar Tongue* (1834); *Magyar-German Dictionary* (1836); *Elements of Hungarian Statute Law* (1839), with a valuable Appendix published at a later date; *The Commercial Law of Hungary* (1840); *Hungarian Bank* (1848); and *Commercial Dictionary.* F. has also contributed much, by his *Essays on the Spirit of the Hungarian Language* (1845), towards its rapid development. He is at present busily engaged (together with Czuczor) in preparing the great dictionary of the Hungarian Academy.

FO'GGIA, an important town of Italy, capital of the province of Capitanata, in Southern Italy, is situated between the rivers Cervaro and Celone, in a district abounding in plantations of olives, vines, and other fruit trees, 80 miles east-north-east of Naples. It is a handsome, well-built town, with spacious streets, good houses, and large shops. Among the chief buildings are the cathedral, a Gothic edifice originally, but partially destroyed by an earthquake in 1731, and afterwards rebuilt in a different style; numerous churches, some of them antique; the custom-house, a beautiful building; and the theatre. It is the centre of all the trade of the province, and has many large corn magazines. Pop. 24,000.

F., supposed to have been built from the ruins of the ancient Arpi, was a favourite residence of the Emperor Frederick II., and here died his wife, Isabella, daughter of the English king, John. It was also for some time the residence of Ferdinand I. and his court, when it ranked as the second city in the kingdom.

FOG-SIGNALS, audible warnings used on board ships, on the sea-coast, or on railways, during fogs and mists, or at any other time when lights or ordinary daylight-signals are not available.

The commonest fog-signal on shipboard is the continuous ringing of the ordinary time-bell, or striking the anchor with a hammer, together with the occasional discharge of musketry and heavy guns. These are adopted, to prevent collisions, when ships are overtaken by a fog in the British Channel, or other places where shipping is abundant. The blowing of a horn, the beating of a drum, an empty cask, a gong, and various other unusual sounds, are also adopted. Steam-vessels generally blow a whistle under these circumstances. These sounds, however, only indicate rudely the position of the ship, and not the direction in which she is sailing. Many plans have been devised for a code of signals, by which the directions north, south, &c., might be indicated by the varying length of each sound, or the intervals between the sounds of a fog-horn or whistle.

It is very desirable that some general code of signals of this kind should be adopted for the merchant service as well as the navy; and that its recognition by the marine of all other nations should be procured. The Admiralty have such a code for the direction of a fleet of ships of war in thick weather, but their application is limited to the navy. Some further remarks on fog-signals will appear under SIGNALS (q. v.).

Fog-signals from the shore are very desirable, especially on a dangerous coast. The ringing of church-bells, and of bells at the coast-guard stations, has been suggested; but there is one serious difficulty here, viz., that when most needed, that is, when a strong wind is blowing in towards the shore, such sounds would be heard only at a very little distance out at sea.

The fog-signals used on railways are small cases charged with detonating powder, and laid upon the rails. They explode loudly when the wheel of an advancing train comes upon them. They are not merely used in fogs, but in all cases of danger, from obstruction of the line, or in other cases of urgency when a train has to be stopped without delay. Station-masters and railway police are furnished with them for the purpose of thus stopping a train at any place.

FOHR, one of the greater Danish islands in the North Sea, on the western coast of the province of Slesvig; its central point is in lat. 54° 42′ N., and in long. 8° 30′ E. It has an area of about 28 square miles, has upwards of 5000 inhabitants, is divided into *Westerlandfohr*, which belongs to the province of Jutland, and *Osterlandfohr*, which belongs to that of Slesvig. The inhabitants are mostly Frisians, who live by taking fish and wild fowl, and by the manufacture of cheese and stocking-ware. The chief place is a bathing-place, called Wyk, with a population of 700.

FOIL, a thin bar of elastic steel, mounted as a Rapier (q. v.), but without a point, and additionally blunted at the end by the presence of a button covered with leather. It is used in Fencing (q. v.).

FOIL (from *folium*, a leaf), a general name for thin metal intermediate in thickness between *leaf-metal*, such as gold, silver, and copper leaf, and *sheet-metal*.

There are two distinct kinds of foil in common use—the tin-foil used for silvering looking-glasses, lining tea-caddies, and other similar purposes, and for the conducting coatings of electrical apparatus; and the bright foils employed by the jewellers for backing real or artificial gems, and thereby increasing their lustre or modifying their colour.

The former is made by rolling out tin, or more recently, by the method of Mr Wimshurst, who casts a cylinder of the metal, and then, by means of a knife or cutter, shaves it into a sheet as the cylinder rolls to the knife, which is gradually moved inwards towards the axis of the cylinder at a rate proportionate to the required thickness of the sheet.

The bright foil used by jewellers and for theatrical and other ornaments under the name of 'tinsel,' is made of copper, tin, tinned copper, or silvered copper. The last is now chiefly used by jewellers. The metal is rolled in a flatting mill, and the requisite brilliancy of surface is produced by finishing between burnished rollers and polishing. The various colours are produced by coating the white metal with transparent colours mixed in isinglass size. A similar varnish without colour is laid over the white foil, to prevent tarnishing. The socket or setting in which the stone or paste is mounted is lined with the foil, and by reflecting from the internal facets the light which passes through the stone, adds considerably to its brilliancy. The natural colours of real stones are sometimes heightened or modified by coloured foil, and factitious colours are thus given to the glass or 'paste,' as it is called, of which spurious gems are made.

There are two other methods of foiling gems, distinct from the above: one of them is to line the socket of the setting with tin-foil, then fill it whilst warm with mercury; after a few minutes, the fluid mercury is poured out, and there remains an amalgam of tin, precisely the same as is used for backing common mirrors; the gem is fitted into this, and thus its back has a mirror surface. The other method is to precipitate a film of pure metallic silver upon the back of the stone, by submitting a solution of the ammonia nitrate of silver in contact with the stone to the reducing action of the oils of cassia and cloves. The silvering of looking-glasses being the chief use to which the ordinary *tin-foil* is applied, its purity is a matter of great consideration; its employment also by chemists, as a ready means of forming some of the tin compounds, renders this absolutely necessary.

Nevertheless, the spirit of adulteration has extended to the tin-foil makers, and lead has been extensively alloyed with the tin. In some analyses recently made, it has been shewn that as much as 85 per cent. of the adulterant metal has been used, the effect of which in the process of silvering mirrors is most injurious to the brilliancy of the amalgam, which should consist of perfectly pure tin and quicksilver. For chemical purposes, it is now absolutely necessary to test for lead before using *tin-foil*.

The foils used by jewellers for backing gems, consisting of small sheets of silvered copper rolled very thin, are coloured with the following preparations, to suit the different gems under which they are to be placed, or for use as tinsel in the manufacture of theatrical ornaments, toys, &c. Lake and Prussian blue, and pale drying-oil finely ground with a slab and mullar—for *amethyst* colour. Prussian blue, similarly prepared—for *sapphire* colour. Dragons' blood dissolved in pure alcohol—for *garnet* colour. Sesquiferrocyanide of iron and bichromate of potash, equal parts very finely ground and sifted, then ground with a quantity of gum-mastic equal to the other two ingredients, until the whole forms an impalpable powder; gradually form this into a thin paste with pure wood-spirit (pyroxylic) and preserve in stoppered bottle; when used, a portion is diluted with wood-spirit to the necessary thinness—for *emerald* colour. *Various shades of yellowish or bluish green can be produced by varying the proportions of the two colouring materials.* Lake or carmine ground in solution of isinglass—for *ruby* colour. A weak solution of orange shell-lac, sometimes tinted with saffron, turmeric, or aloes—for *topaz* colour. Several other colour-varnishes are made by similar methods for various shades of tinsel and gem foils. See SILVERING.

FOIX, a small and unimportant town of France, in the department of Ariège, and on the left bank of the river of that name, 44 miles south-south-east of Toulouse. It has a picturesque old castle, with three well-preserved towers of whitish marble, all of different ages, and all dating from before the 15th century. It has some trade in iron, and in the vicinity are numerous ironworks. Pop. 5260. F. was capital of the old county of *Foix*.

FOIX, an old French family, which took the title of count from the district of Foix (now the department of Ariège), in the south of France. The first who bore the title was Roger, Comte de Foix, who flourished in the middle of the 11th century. Raymond, Comte de Foix, figures as one of the knights who accompanied King Philippe Auguste to Palestine; afterwards, being accused of heresy, his estates were seized by Comte de Montfort. He died in 1223. Several members of the family subsequently distinguished themselves in the wars against England. Gaston III., Comte de Foix, born 1331, and called, on account of the beauty of his person, Phœbus, was noted for his knightly love of splendour and military prowess. For his services to the king, he was made governor of Languedoc and Gascony. When only 18, he married Agnes, daughter of Philip III., king of Navarre. In 1358, during the insurrection known as the *Jacquerie* (q. v.), he delivered the royal family from the power of the rebels. When Charles VI. wished to deprive him of the government of Languedoc, he maintained his position by force of arms, and defeated the Duc de Berri in the plain of Revel. He was inordinately attached to the chase, and is said to have kept 1600 dogs. He also wrote a work on the subject, entitled *Miroir de Phêbus des deduitz de la Chasse des Bestes sauvaiges et des Oyseaulx de Proye*, which went through several editions in the 16th and 17th centuries, and whose bombastic style (*faire du Phêbus*) became a byword. Froissart owed some of the choicest incidents in his history to having lived for some time in the castle of Orthes, Gaston's principal residence. After his death, in 1391, the estates and title went to a collateral branch of the family. Gaston IV., Comte de Foix, rendered good service to the king in the wars against England. In 1455, his father-in-law, John II., king of Navarre, named him his successor. In addition to this, Charles VII. created him a peer of France, and ceded to him his claims upon Roussillon and Cerdagne. He died in 1472, when the family possessions were again divided. The last, his grandson, Gaston de Foix, was probably the most heroic member of the family. Son of Jean de Foix, Comte d'Estampes, and Marie d'Orléans, sister of Louis XII. of France, he was born in 1489, and in 1507 received from his uncle, the French king, the title of Duc de Nemours. In the Italian wars carried on by Louis, Gaston displayed the most brilliant and precocious genius. He twice overthrew the Swiss, at Como and Milan; chased Pope Julius II. from Bologna; seized Brescia out of the hands of the Venetians; and, to crown a series of splendid triumphs, which obtained for him the title of the *Thunderbolt of Italy*, won the great battle of Ravenna over the Spaniards, 11th April 1512, in which, however, he fell, at the early age of twenty-three. On his death, the estates and title of the House of Foix went to Henri, king of Navarre, whose daughter, Jeanne d'Albret, married Antoine de Bourbon, Duc de Vendôme, and became the mother of the great Henri Quatre, who thus attached the county of Foix to the French crown.

FO'LCLAND, or **FOLKLAND**, the land of the folk or people in England in Anglo-Saxon times. The folcland, according to Turner, was that portion of the kingdom which was retained in behalf of the public, and with a view to increasing population and the growing wants of the community, and not permitted to become allodial estate or absolute private property. Of this land, the usufruct or *dominium utile* was enjoyed by the freemen, for which certain rents were paid to the state, and which did not become hereditary. On the contrary, the rights which were held in it by individuals reverted to the community at the expiry of a particular term, when it was again given out by the folcgemot or court of the district, either in commonty or in severalty. Certain services to the public were commonly imposed on the holders of folcland, such as the reparation of the royal vills and other public works; the exercise of hospitality to the king, and to other personages of distinction in their progresses through the country, by furnishing them and their messengers, huntsmen, hounds, hawks, and horses with food, and providing them, when necessary, with means of transport. It does not seem that the folcland was held exclusively by the common people, but rather that it was open to freemen of all ranks and conditions, and that the possession of it was much coveted even by those who held great estates on the hereditary title which was known as *Bockland* (q. v.). Folcland was often given out as bockland to those who had performed great public services, just as Horatius was rewarded by a grant of the Roman *ager publicus*—

> 'They gave him of the corn-land
> That was of public right,
> As much as two strong oxen
> Could plough from morn till night!'

It was also frequently given to the church, for the purpose of founding monasteries and the like, a practice of which Bede complains in his celebrated letter to Archbishop Egbert. 'It is disgraceful to say, persons who have not the least claim to the monastic character, as you yourself best know, have got so many of these spots into their power, under the name of monasteries, that there is really now no place at all where the sons of nobles or veteran soldiers can receive a grant.'—Kemble's *Saxons*, p. 291. Kemble gives examples of the dues paid by monasteries for the folcland which they held, which afford curious information as to the products of industry and modes of living of those times. In 883, a monastery is freed from all dues which the monks were still bound to pay to the king's hand, including bright ale, beer, honey, oxen, swine, and sheep. The dues of the monastery at Taunton were—a feorm (or entertainment) of one night to the king, and eight dogs and one dog-keeper; and nine nights' keep for the king's falconers, and carriage, with wagons and horses, for whatever he would have taken to Curry or Wilton; and if strangers came from other parts, they were to have guidance to the nearest royal vill upon their road.—*Ib.* 295, 296.

FÖLDVAR, a town of Hungary, in the county of Tolna, is situated on the crest and slope of a hill on the right bank of the Danube, 48 miles south of Pesth. It has a Roman Catholic high school, is a steam-boat station, has an important sturgeon-fishery, and considerable trade in wines and agricultural produce. Pop. 11,800.

FO'LIA MALABA'THRI, i. e., Malabar Leaves, formerly in much repute as a medicine; an aromatic tonic; the dried leaves of *Cinnamomum nitidum*, and partly of *C. Tamala*, species of cinnamon, small Indian trees or shrubs.

FOLIA'TION, a term restricted by Mr Darwin, and subsequently by geologists, to the alternating layers or plates of different mineralogical nature, of which gneiss and some other metamorphic schists are composed. It differs from cleavage, which is applied to the divisional planes that render a rock fissile, although it may appear to the eye quite or nearly homogeneous; and from lamination, which is the easy splitting of a rock into its original layers of deposition. It is difficult to determine the cause of foliation. Some hold that as gneiss is composed of the disintegrated ingredients of granite, the layers are identical with the original laminæ, having been arranged according to their various densities. But it can scarcely be conceived that water would be able to deposit such materials in the same order over areas so immense as those occupied by gneiss strata. It seems more probable that the arrangement is owing to some widespread metamorphic and segregating force, which operated subsequently to the deposition of the beds.

FOLI'GNO, a town of Central Italy, in the province of Perugia, in the fruitful valley of the Topino, 18 miles north of Spoleto. It was formerly surrounded by walls, which, however, have been converted into promenades. It has regular streets, and some important buildings, including the beautiful cathedral, the theatre, the Palazzo Communale, the hospital, and several churches. Raphael's Madonna di Foligno, now in the Vatican, formerly hung in a convent here. The manufactures are woollens, paper, and wax-candles. Pop. 8100.

F., the ancient Umbrian *Fulginium*, was called in the middle ages Fulignum. In 1832 it suffered severely from an earthquake.

FOLKES, MARTIN, LL.D., an eminent English scholar and antiquary, born at Westminster in 1690, was educated at Clare Hall, Cambridge. In 1713, he was chosen a fellow of the Royal Society of London; and in 1741 he succeeded Sir Hans Sloane as president of that learned body. He was also a member of the Antiquarian Society, and of the Royal Academy of Sciences at Paris. He died in 1754. F. was the author of *A Table of English Gold Coins from the 18th Edward III., when Gold was first coined in England* (Lond. 1736, 4to), with *A Table of English Silver Coins, from the Norman Conquest; to which is added an Appendix, answering the Coins minted in Scotland since the Union of the two Crowns* (Lond. 1745, folio), published under the care of the Antiquarian Society, superintended by Dr Giffard (1763, 2 vols.). Besides these works, F. contributed a number of papers to the *Philosophical Transactions.*

FOLK-LORE, a term recently introduced into English from the German, as applicable to what may be called a department of antiquities or archæology—viz., that which relates to ancient observances and customs, and also ideas, prejudices, and superstitions among the common people. In England, the literature of this subject may be said to have commenced with the *Miscellanies* of John Aubrey, published in 1696, in which we find chapters on Day Fatality, Omens, Dreams, Corpse Candles, Second Sight, and kindred matters, to which that learned but credulous author—an early member of the Royal Society—had given his attention. Here, however, the superstitions, rather than the ordinary observances and customs of the people, were detailed. The first book addressed to the general subject of folk-lore was an octavo volume by the Rev. Henry Bourne, published at Newcastle in 1725, under the title of *Antiquitates Vulgares, or the Antiquities of the Common People.* It mainly consists of an account of the popular customs in connection with the feasts of the church. Fifty years after its publication, John Brand, M.A., a native of Newcastle, busied himself in extending the collections which originated with Bourne, and in 1777 he published at that city the first edition of his *Observations on the Popular Antiquities of Great Britain*, a work which was subsequently enlarged by himself, partly from the stores of folk-lore presented in the *Statistical Account of Scotland* (edited by Sinclair, 1791—1795), but was left to be re-issued, under a thoroughly revised form, in 1813 (2 vols. 4to), by Henry Ellis of the British Museum. This work, in which Bourne's was incorporated, has since been twice reprinted, with additions, and might have been regarded as an exhaustive work on the subject, if it had not been shewn by Hone's *Every Day Book* and *Year Book*, and the useful little periodical entitled *Notes and Queries*, that, after all, many curious particulars of English folk-lore remained to be gleaned. Through all these various channels, we now have tolerably ample information on popular festivals of every kind, both those which appear to have originated in pagan times, and those instituted by the Christian Church, on all observances connected with the important movements of domestic life, as marriages, sepulture, &c.; on fireside amusements, on superstitions and vulgar errors. What may be called a sub-section of folk-lore has at the same time been amply illustrated in the *Nursery Rhymes*, edited by J. O. Halliwell, and the *Popular Rhymes of Scotland*, edited by Robert Chambers. It is to be observed that, while folk-lore has thus been engaging the attention of literary men, and put beyond risk of oblivion by taking its place in solid books, it is everywhere declining among the people themselves. To this effect, the diffusion of scientific ideas, the disfavour of the clergy for everything connected with the supernatural except religion itself, and the great industrial changes and improvements of the last fifty years, including a greatly increased shifting of the people from one district to another, have all conduced. In the British Islands, no effort has been made to generalise folk-lore for any purpose connected with anthropology, ethnology, or any other science; but in Germany, as is well known, the learned brothers, Jacob and Wilhelm Grimm, have turned the ancient simple usages and traditions of the peasant's fireside to excellent account in illustrating remote periods of the national history.

FOLKMOTE (a meeting or assembly of the 'folk' or people) was the term applied by the Saxons to district meetings generally, though Kemble is of opinion that originally it was the great meeting of the nation, which was afterwards converted into the Witenagemôte, or meeting of the councillors or representatives of the nation (Kemble's *Saxons in England*, ii. p. 194).

FOLKRIGHT, mentioned in the laws of King Edward the Elder, is nearly synonymous with the common law, or rather with the rights which the common law confers on the people of England.

FO'LKSTONE, a rising town of England on the south-east coast of Kent, is a municipal borough, seaport, and bathing-place, and is situated 83 miles east-south-east of London by rail, and five miles west-south-west of Dover. It stands on uneven ground at the foot of a range of hills. The oldest part lies in a narrow valley, crossed by a magnificent railway viaduct. It has rapidly extended and improved since the opening of the South-eastern Railway, and the establishment of steam-packets from this town to Boulogne, 30 miles to the south-east. Between the two places is a submarine chain of rocks only 14 fathoms under low water. Pop. (1861) 8528. F. unites with Hythe in returning one member to parliament. In 1860, 1550 vessels, of 226,051 tons, entered and cleared the harbour. The view from the pier extends from Shakspeare Cliff, at Dover, to Fairlight Head, at Hastings; the Boulogne heights are also seen. On a hill in the vicinity are the remains of Roman intrenchments. Here Harvey, the discoverer of the circulation of the blood, was born.

FOMENTA'TION (Lat. *fomentatio*; also *fotus*, from *foveō*, I bathe), an application of warmth and moisture to a part, by means of cloths wrung out of hot water, sometimes medicated with vegetable infusions of substances calculated to relieve pain or stimulate the surface. Thus, opium, belladonna, chamomile, turpentine, &c., are used in various forms in connection with fomentations, which are of very great service in the treatment of almost all painful local disorders.

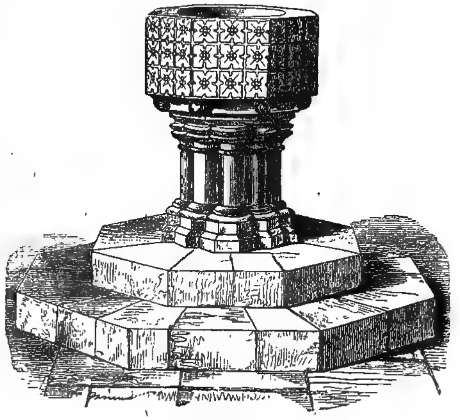
FONBLANQUE, ALBANY, journalist, born in 1797, was intended for the bar, and became a pupil of Chitty, the eminent special pleader. Castlereagh's Six Acts made him a political writer. As editor of the *Examiner*, the then leading Liberal weekly journal, F. exhibited a singular keenness both of wit and intellect, and exercised no inconsiderable influence on public opinion between the years 1826 and 1836. Leigh Hunt, who was his predecessor in the editorship of the *Examiner*, says of him in his Autobiography, 'He was the genuine successor not of me, but of the Swifts and Addisons themselves; profuse of wit even beyond them, and superior in political knowledge.' The characteristics of his political writings may be gathered from his work, entitled *England under Seven Administrations* (1837), which is simply a reprint of the more historical leading articles published in the *Examiner* from the period of the Canning and Goderich ministries, to the return of the Melbourne ministry. F.'s services to the Whigs were rewarded by his appointment to the office of secretary to the Statistical Department of the Board of Trade in 1852. This post, which he still holds (1862), does not, it is understood, interfere with his occasional contributions to the journal with which his name has been so long associated.

FOND DU LAC is a name of various application in that portion of the United States which originally belonged to French Canada. Primarily denoting the inner extremity of any great body of fresh water, it has, secondarily, been made to indicate adjacent localities of different kinds, chiefly in connection with Lake Superior, the grand reservoir of the St Lawrence, and Lake Winnebago, which empties itself from the westward into Lake Michigan.—1. The Fond du Lac of Lake Superior has lent its appellation to a village in Minnesota, situated at a distance of about 20 miles, on its navigable tributary, the St Louis.—2. The Fond du Lac of Lake Winnebago designates both a county and town of Wisconsin. The latter has sprung up mainly since 1845, has a pleasant situation on a wooded slope above the lake, an important trade in grain, provisions, and timber, a great number of Artesian wells, and a population in 1859 of about 8000.

FO'NDI (anciently, Fundi), a small town of Italy, in the north-west of the province of Terra di Lavoro, is situated six miles from the coast, on the Appian Way, which now forms its principal street, 56 miles north-west of Naples. It is an ill-built, dirty, and miserable town, in the neighbourhood of a pestiferous lake (the ancient *Lacus Fundanus*); the surrounding plain, however (the ancient *Cæcubus Ager*, which produced the famous Cæcuban wine of classic times), is very fruitful. F. is surrounded in part by walls of cyclopean structure, and has a population of 5700, who are said to be in the highest degree wild and lawless.

FONSE'CA, a bay on the Pacific coast of Central America, lies between the two states San Salvador and Nicaragua. It claims notice principally as the proposed terminus of an interoceanic railway from the Puerto Caballos in Honduras. The intervening country has been surveyed, and reported as favourable.

FONT (*Fons Baptismalis*), the vessel used in churches as the repository of the baptismal water. In the early period, while immersion continued to be the ordinary rite of the administration of the sacrament of baptism, the baptistery (see BAPTISTERY), or other place set apart for the ceremony, was furnished with a basin sufficiently capacious to admit of the administration of the rite according to the then prevailing form. But when it became customary to baptize by affusion—that is, by pouring the water on the head of the person to be baptized—the size of the basin was naturally diminished, and eventually it assumed the dimensions and the form which are now familiar to us in most of the medieval churches in Great Britain and upon the continent. The baptismal font, in its normal form, consists of a basin or cup, more or less capacious, hollowed out of a solid block, and supported upon a stem or pedestal. It is ordinarily of stone, but some ancient examples of leaden fonts also occur, and a few of copper or of bronze. In general, however, it may be said that the font, in its external form and character, followed the prevailing style of ecclesiastical architecture and ornamentation. From its connection with one of the most solemn rites of religion, it became very early a favourite subject for the exercise of the decorative skill of the artist, and there are still preserved in different churches fonts which exhibit characteristics of each and all the successive fashions through which church architecture has passed since the introduction of the font in its present form. There is some doubt as to whether any existing specimen in England really belongs to the Saxon period, but examples are found of all the later styles, from the Early Norman down to the latest revival of Gothic architecture in our own day; the Early English, the Decorated, of which a beautiful example occurs in the church of All Saints, Norwich; and the Perpendicular, which is seen in its highest perfection at East Dereham in the same county of Norfolk. The annexed engraving exhibits a highly characteristic specimen of the fonts of the beginning of the 14th c., which stands in the church of Swaton, Lincolnshire, erected about 1310.



Font.

The external figure of the basin seems to have been originally circular or elliptical; but most of the later fonts are hexagonal, or even eight-sided. The basin was commonly supported on a single pillar or stem. Many cases, however, occur in which it rests on three, four, or five pillars, or, as in the engraving, on a group of pillars or pilasters united into a solid stem. The exterior, as well of the basin as of the pedestal, was often highly decorated, ordinarily with sculpture, but occasionally also in gold and colours; the designs on the basin commonly representing subjects connected with baptism, or its types and symbols. We frequently meet around the pedestal figures of the apostles, sometimes only eleven in number, Judas being omitted.

In the Roman Catholic Church, the service of Easter Saturday contains a solemn form for the blessing of the baptismal font. After a long series of prayers, and amid a very imposing ceremonial, the 'chrism,' or consecrated oil blessed by the bishop, and also the so-called 'oil of catechumens,' are mingled with the baptismal water, which is reserved for subsequent use. With a view to the preservation of the water thus reserved, the font, especially when it is of porous stone, is sometimes lined with lead; and from an early date, it is furnished with a lid, which is secured by a lock, and is often of a highly ornamental character.

The ordinary place of the font is at the western end of the nave, near the entrance of the church, but in many cases it stands in a separate chapel or baptistery, or at least in a compartment screened off for the purpose. Even when it stands in the open nave, it is properly enclosed by a rail.

The baptismal font is not to be confounded with the 'holy-water fount,' which usually stands near the entrance of Roman Catholic churches, and from which persons entering sprinkle their forehead, in recognition of the inward purity with which we ought to enter the house of God; nor with the *piscina* or *sacrarium*, which is found in the chancel or the sacristy of ancient churches, and which was intended to receive and carry away the water used in cleansing the sacred vessels, the altar-linens, and the other furniture used in the administration of the eucharist. See Paley's *Illustrations of Baptismal Fonts;* Simpson's *Series of Baptismal Fonts;* Wetser's *Kirchen-Lexicon;* Binterim's *Denkwürdigkeiten.*

FONTAINEBLEAU, a town in France, in the department of Seine-et-Marne, is beautifully situated in the midst of an extensive forest, near the left bank of the Seine, 35 miles south-east of Paris, with which it is connected both by steamers on the Seine, and by railway. There are several fine public buildings, among others, two hospitals—one erected by Anne of Austria, the other by Madame de Montespan. It furnishes a great deal of wine and fruit for the capital, and has manufactures of porcelain. Its grapes are famed as *Chasselas de Fontainebleau.* Pop. 10,669.

F. is chiefly famous for its château, or pleasure-palace of the kings of France, and the forest that surrounds it. The forest covers an extent of 64 square miles, and presents much fine scenery. The château is said to have originally been founded by Robert the Pious toward the end of the 10th century. It was rebuilt in the 12th c. by Louis VII., of whom, and of Philippe Auguste, it was a favourite residence, and was enlarged by Louis IX. and his successors. After being allowed to fall into decay, it was repaired and embellished by Francis I., who here received the Emperor Charles V. with lavish splendour, in 1539. Almost every succeeding king added something in the way of enlargement or embellishment, so that it bears the character and style of almost every century.

In the 17th c., it was the residence of Christina of Sweden after her abdication, and in the *Galerie des Cerfs* she caused her secretary Monaldeschi to be executed. Under Louis XIV. it was occupied by Madame de Montespan, and under Louis XV. by Du Barry; and here Pope Pius VII. was detained a prisoner for nearly two years by Napoleon. Many state transactions and treaties are dated from F.; among others, the act of abdication of Napoleon in 1814. Louis Philippe had all the paintings renovated, and the apartments restored in the taste of the 16th century.

FONTA'NA, DOMENICO, an eminent engineer and architect, born in 1543 at Mili, in the vicinity of Lake Como. At the age of twenty he joined his brother, also an architect in Rome, and in a brief period achieved a reputation sufficiently brilliant to attract the notice of the magnificent Cardinal Montalto, to whom he was appointed private architect. The pomp of this cardinal seems to have given umbrage to Pope Gregory XII., who, in consequence, discontinued the cardinal's private pensions, and thus disabled him from completing the splendid works he had intrusted to F.—viz., the Sistina Chapel in Santa Maria Maggiore, and an adjoining palace. In this emergency, the spirited architect, out of his own funds, carried on the noble designs of his patron, on the same scale of magnificence in which they were commenced, and for his disinterested devotion received later ample reward, when the cardinal, under the name of Sixtus V., was called to the papal chair. F., as papal architect, was employed in a variety of important works, amongst which stands conspicuously the wonderful removal and re-erection of the colossal Egyptian obelisk, to be seen now in the piazza of St Peter's. He afterwards erected several other obelisks, and was intrusted by Sixtus with the construction of the Lateran Palace, and of the famous Vatican Library. The restoration of the columns of Trajan and Antoninus, and the construction of the aqueduct known as the *Aqua Felice*, deserve mention amongst the many works of utility executed by Fontana. On the death of his friend and patron, Pope Sixtus, F., through the intrigues of invidious enemies, was stripped of his post as papal architect in 1592, but was immediately proffered a similar appointment in the name of the king of Naples. During his sojourn in Naples, he executed many imposing designs; the royal palace, and a noble promenade along the bay, being amongst the chief. His conception of a grander harbour was carried into effect by others, his death, in 1607, at Naples, preventing his personal superintendence benefiting the undertaking. F.'s son, Giuglio Cesare, heir to his father's great wealth, and some of his genius, was appointed royal architect on his decease.

FONTA'NA, FELICE, a celebrated physiologist, born at Pomarolo, in the Italian Tyrol, in 1730. At the termination of an elaborate course of study, carried on in the several universities of Verona, Parma, Padua, and Bologna, he was presented to the chair of philosophy in the university of Pisa by Francis I., Grand Duke of Tuscany. Leopold, on succeeding his father, appointed F. court physiologist, and charged him with the organisation of a museum of natural history and physiology, which to this day is one of the scientific marvels of Florence. It comprises a superb collection of the phenomena of the animal, vegetable, and mineral kingdoms, besides an exquisitely elaborate series of wax models, representing the human body as a whole, and each minute separate organ. A similar collection was executed by F. for the museum of Vienna, by order of the Emperor Joseph II. He died 9th March 1803. F.'s chief writings consist of scientific considerations on the various phenomena of physical irritability, *Richerche Filosofiche sopra la Fisica Animale* (Florence, 1781), and *Dei Moti dell' Iride* (Lucca, 1765).

FONTANES, LOUIS, MARQUIS DE, was born 6th March 1757, at Niort, and was sprung from an old Protestant family of Languedoc. After the completion of his studies, he went to Paris, where he acquired a reputation by his poems, *Le Cri de mon Cœur* (Paris, 1778), and *Le Verger* (Paris, 1778), as also by his metrical translation of Pope's *Essay on Man*, and his imitation of Gray's *Elegy written in a Country Churchyard.* During the Revolution, F. conducted various journals in the popular interest. In 1802, he was made a member, and in 1804 president of the legislative body. His admiration of Napoleon was great; and his splendid oratorical talents were often employed in eulogising the emperor's acts. Even when Napoleon was only consul, F. had irritated the republican party by speaking of the French people as *sujets* (subjects). In 1810, he entered the senate. After the fall of Napoleon, he passed into the service of the restored Bourbons, and was raised to the peerage by Louis XVIII. He died 17th March 1821. His various writings, prose and poetic, have been collected and edited by Sainte-Beuve (2 vols., Paris, 1837), and are regarded as models of elegance and correctness.

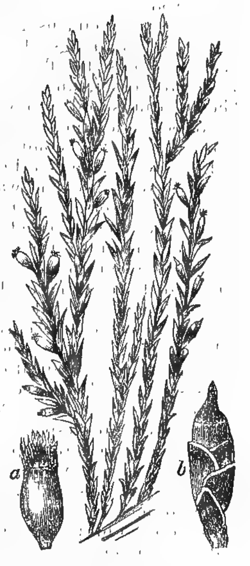
FONTENAY-LE-COMTE, or **FONTENAY-VENDÉE**, a town of France, in the department of Vendée, is situated in a pleasant valley on the right bank of the Vendée, 27 miles north-east of La Rochelle. The streets of the older portion of the town are narrow and tortuous. Its chief buildings are the beautiful Gothic church of Notre Dame, with a spire 311 feet high; the college, the theatre, and the fountain from which the town is said to have derived its name. F. has linen manufactures, tanneries, and a trade in timber, and is an entrepôt for the victuals and commodities of the south. Pop. 7780.

FONTENELLE, Bernard le Bovier de, an eminent French author, was born at Rouen, 11th February 1657. His father was an advocate, and his mother a sister of the great Corneille. He began his studies in the college of the Jesuits at Rouen, and at the age of 13, obtained the prize for a Latin poem. During the next three years he professed to study law, but in reality busied himself with the more interesting subjects of history, poetry, and philosophy. After passing as an advocate, he commenced to practise, but lost the first cause which he conducted, and, in consequence renounced the bar for ever. In 1674, he went to Paris, where he entered upon a literary career, and soon attained to celebrity and independence. He was a member of several learned societies; and from 1699 to 1741, held the office of Secretary of the Académie des Sciences, but declined the post of president. F. died at Paris 9th January 1757, having nearly finished his 100th year, wittily remarking to his friends, as he expired: 'Je ne souffre pas, mes amis; mais je sens une certaine difficulté d'être' ('I don't suffer, my friends; but I feel a sort of difficulty in living any longer'). The greater part of his numerous poetical, historical, oratorical, philosophical, and scientific writings, though much admired at the time of their publication, have now fallen into oblivion. He possessed, however, along with great skill in representation, a poetical turn of mind, and an acute intellect. He wrote a few operas, among others, *Psyché*, *Bellérophon*; a musical and dramatic pastoral entitled *Endymion*; several tragedies—*Brutus*, *Aspar*, *Idalie*; comedies, fables, fugitive pieces, epigrams, &c. Of his prose writings, we may mention the *Lettres du Chevalier d'Her*, the *Dialogues des Morts*, in the manner of Lucian; his *Entretiens sur la Pluralité des Mondes*, which, although much read once, has now become obsolete, in consequence of the advancement of science; and his treatises *Sur l'Existence de Dieu*, *Sur le Bonheur*, *Sur l'Origine des Fables*; and his *Histoire du Théâtre Français jusqu'à Pierre Corneille*, which is still consulted. F. was particularly celebrated for his *bon-mots*; and for the manner in which he edited the *Mémoires de l'Académie des Sciences*, and executed his *Eloges*. It is also perhaps worth mentioning, that at the age of 92 he still wrote madrigals! His *Œuvres Complètes* have been republished several times. The most complete edition is that published at Paris (3 vols. 1818).

FONTENOY, a village of Belgium, in the province of Hainaut, 5 miles south-west of Tournay, with a population of about 800, deserves mention as the scene of the battle of Fontenoy, one of the most famous contests in the war of the Austrian Succession. The battle was fought 11th May 1745, the opposing forces being the French, 60,000 strong, under Marshal Saxe, and the allies (English, Dutch, and Austrians), in nearly equal force, under the Duke of Cumberland. After a hard-fought fight, the allies were forced to retreat. The loss on both sides was stated at about 7000 men.

FONTEVRAULT (*Fons Ebraldi*), a small town of France, in the department of Maine-et-Loire, 8 miles south-east of Saumur, with a population of about 830, owes its origin to a wealthy and celebrated abbey, now converted into a prison for eleven departments. This abbey was founded by Robert d'Arhrissel, a Breton monk, in 1099, as the residence of a monastic society composed of penitents of both sexes. This society took the name of the *Order of Fontevrault*. It followed the austere rule of Benedict, but had this peculiarity, that the monks were ruled by an abbess, and not by an abbot. The order of F. soon spread through France, and into Spain, and in the former country especially acquired great riches. The abbesses of F. belonged, for the most part, to illustrious families, and were subject only to the popes. At a later period, the strictness of the monastic discipline was relaxed in favour of the nuns, whence, however, in the 14th c., sprung great disorders. Gradually, the order of F. fell into disrespect, but even at the outbreak of the French Revolution it possessed 57 priories in France, which, however, were then abolished along with the other monasteries. The town is of peculiar interest to Englishmen, from the fact that it contains the cemetery of several of the Plantagenet kings of England and of the counts of Anjou. Of these, however, only the tombs of Henry II., of his queen Eleanor of Guienne, of Cœur-de-Lion, and of Isabelle, the queen of John, have been preserved. The old monastic buildings and courtyards, surrounded by walls, and covering from forty to fifty acres, now form one of the larger prisons of France, in which about 2000 convicts of both sexes are confined, and kept at industrial occupations. See an account of this prison in *Chambers's Edinburgh Journal*, 2d series, vol. i. p. 104.

FONTI'NALIS, a genus of Mosses, allied to *Hypnum*, but having the fruit in the bosom of the leaves, almost without stalk. Several species are British; one of which, the Greater Water-moss (*F. antipyretica*), growing upon rocks and roots of trees in brooks and ponds, is remarkable for the difficulty with which it burns, even when completely dried; on which account it is used in some parts of the north of



Greater Water-Moss (*Fontinalis antipyretica*); *a*, spore-case or capsule, divested of calyptra and lid, shewing the peristome; *b*, spore-case, with its involucre of leaf-like scales.

Europe for lining chimneys, to protect the adjacent wood-work from fire. Its shoots are a foot or more in length, and branched; they float in the water. The fruit is on the sides of the stems or branches.

FOOD AND DRINK. Although nearly sixty elementary substances are known to chemists, only a comparatively small number of these take part in the formation of man and other animals; and it is only this small number of constituents which are essential elements of our food. These elements are carbon, hydrogen, nitrogen, oxygen, phosphorus, sulphur, chlorine, sodium, potassium, calcium, magnesium, iron, and fluorine.

Carbon, hydrogen, nitrogen, and oxygen are supplied to the system by the albuminous group of alimentary principles (see DIET)—viz., albumen, fibrine, and caseine, which occur both in the animal and vegetable kingdoms, and the gluten contained in vegetables. Animal flesh, eggs, milk, corn, and many other vegetable products, contain one or more of these principles. The gelatinous group also introduces the same elements into the system, when such substances as preparations of isinglass, calves' feet, &c., are taken as food. Carbon, hydrogen, and oxygen are abundantly introduced into the system in the form of sugar, starch (which occurs in large quantity in the cereal grains, leguminous seeds, roots, tubers, &c., used as food), and organic acids (which, as citric, malic, tartaric acid, &c., occur in numerous vegetables employed as food). Carbon with a little hydrogen and oxygen occurs abundantly in the oleaginous group of alimentary principles, as, for instance, in all the fat, suet, butter, and oil that we eat; in the oily seeds, as nuts, walnuts, cocoa-nuts, &c.; and in fatty foods, as liver, brain, &c. Phosphorus is supplied to us by the flesh, blood, and bones used as food (the flesh of fishes is especially rich in phosphoric matter), and in the form of various phosphates, it is a constituent of many of the vegetables used as food. The system derives its sulphur from the fibrine of flesh, the albumen of eggs, and the caseine of milk, from the vegetable fibrine of corn, &c., from the vegetable albumen of turnips, cauliflowers, asparagus, &c., and from the vegetable caseine of pease and beans. Most of the culinary vegetables contain it, especially the *Cruciferæ*. Chlorine and sodium, in the form of chloride of sodium, are more or less abundantly contained in all varieties of animal food, and are taken separately as common salt. Potassium is a constituent of both animal and vegetable food: it occurs in considerable quantity in milk, and in the juice that permeates animal flesh; and most inland plants contain it. We derive the calcium of our system from flesh, bones, eggs, milk, &c. (all of which contain salts of lime); most vegetables also contain lime-salts; and another source of our calcium is common water, which usually contains both bicarbonate and sulphate of lime. Magnesium in small quantity is generally found in those foods that contain calcium. Iron is a constituent of the blood found in meat; and it occurs in smaller quantity in milk, in the yoke of egg, and in traces in most vegetable foods. Fluorine occurs in minute quantity in the bones and teeth. This small quantity is accounted for by the traces of fluorine found by Dr George Wilson in milk, blood, &c.

These simple bodies are not, however, capable of being assimilated and converted into tissue; they must be previously combined, and this combination is primarily conducted by the vegetable kingdom. The number of combined elements varies: thus water contains only two; sugar, starch, fat, and many organic acids, contain three; caseine contains five; and fibrine and albumen contain six.

It would be impossible, and it is quite unnecessary, to mention in this article the different animals and plants that are used as food by different nations. The subject is, however, an interesting one, and those who wish to study it may be referred to Moleschott's *Physiologie der Nahrungsmittel*, 1850, and especially to Reich's *Nahrungs- und Genussmittelkunde* (1860—1861), which is the most learned and elaborate work on the subject in any language.

DRINKS are merely liquid foods. They all pertain to the aqueous group noticed in the article DIET. They are arranged by Pereira in his *Treatise on Food and Diet* in the six following orders:

1. Mucilaginous, farinaceous, or saccharine drinks—as toast-water, barley-water, gruel, &c. They are very slightly nutritive, and differ but little from common water.

2. Aromatic or astringent drinks—as tea, coffee, chocolate, and cocoa. The action of the first two is noticed in the article DIET. The last two drinks contain a considerable quantity of oil and starch.

3. Acidulous drinks—as lemonade, ginger-beer, raspberry-vinegar water, &c. They allay thirst both by the acid which they contain and the water, and form cooling antiscorbutic drinks.

4. Drinks containing gelatine and osmazome—the broths and soups. These, if properly prepared, should contain all the soluble constituents of their ingredients.

5. Emulsive or milky drinks—as animal milk, the milk of the cocoa-nut, and almond milk, a drink prepared from sweet almonds. Animal milk contains all the essential ingredients of food; the others are slightly nutritive.

6. Alcoholic and other intoxicating drinks—including malt liquor or beer in its various forms of ale, stout, and porter; wines; spirits in their various forms of brandy, rum, gin, whisky, &c.

'Considered dietetically,' says Pereira, 'beer possesses a threefold property: it quenches thirst; it stimulates, cheers, and, if taken in sufficient quantity, intoxicates; and lastly, it nourishes or strengthens. The power of appeasing thirst depends on the aqueous ingredient which it contains, assisted somewhat by its acidulous constituents (carbonic and acetic acid); its stimulating, cheering, or intoxicating power is derived either wholly or principally from the alcohol which it contains (from 2 to 3 per cent.); lastly, its nutritive or strengthening quality is derived from the sugar, dextrine, and similar substances contained in it; moreover, the bitter principle of hops confers on beer tonic properties. From these combined qualities, beer proves a refreshing and salubrious drink (if taken in moderation), and an agreeable and valuable stimulus and support to those who have to undergo much bodily fatigue.'

Wine is our most valuable restorative when the powers of the body and mind have been overtaxed; but as the most perfect health is compatible with total abstinence from it, no possible benefit can accrue to a healthy person from commencing its use. The uses of wine as a tonic during convalescence after lingering diseases, and of either wine or spirits in some acute diseases (fevers, &c.), are too well known to require notice.

The action of spirituous drinks has been noticed in the article DIET, and will be further discussed in the article TEMPERANCE.

We shall conclude this part of the subject with a word or two on the condiments or seasoning agents which are taken with foods for the purpose of improving their flavour. Excluding salt, which must be considered as a saline alimentary principle, the most common condiments, such as mustard, capsicum (Cayenne pepper), pepper, the various spices, &c., owe their action to the presence of a volatile oil. Sauces are usually fluid mixtures of these condiments with alimentary substances. In a healthy state, condiments and sauces afford little or no nutrition; and although for a time they may stimulate a debilitated stomach to increased action, their continual use never fails to induce a subsequent increased weakness of that organ. Salt and vinegar are the only exceptions. When used in moderation, they assist in digestion; vinegar, by rendering muscular fibre more fluid; and both together, by producing, as Dr Beaumont believes, a fluid having some analogy to the gastric juice (*Experiments and Observations on the Gastric Juice and the Physiology of Digestion*, p. 40, Edin. 1838).

The cookery of foods, although partially noticed in the articles Boiling, Broiling, Cookery, Diet, &c., requires some general consideration in the present place.

All foods possessing an organised structure, as animal flesh and amylaceous substances, require to be cooked before being eaten, the only exceptions being the oyster and some ripe fruits. The processes of salting, pickling, and smoking harden the animal textures, and, as we shall presently see (at all events in the case of salting), induce chemical changes which render the meat less nutritious.

The ordinary operations of cookery are boiling, roasting, broiling, baking, and frying.

In the case of vegetables, boiling effects the solution of gummy and saccharine matters, the rupture and partial solution of starch grains, the coagulation of albuminous liquids, and the more or less complete expulsion of volatile oil. In the boiling of flesh, there takes place a more or less perfect separation of the soluble from the insoluble constituents, according to the duration of the boiling, the amount of water employed, and its temperature at the commencement of the operation. If we wish the boiled meat to contain the largest amount of nourishing matter, and disregard the soup or broth that is simultaneously formed, we introduce it into the boiler when the water is in a state of brisk ebullition. We keep up this boiling for a few minutes, in order to coagulate the albumen near the surface, and thus to convert it into a crust or shell, which equally prevents the entrance of water into the interior, and the escape of the juice and soluble constituents of the flesh into the water. If cold water is then added, so as to reduce the temperature to about 160°, and this temperature is kept up for the necessary time—for which, in reference to the weight of the meat, see the article Boiling—all the conditions are, according to Liebig, united which give to the flesh the quality best adapted to its use as food.

If, on the other hand, we wish to obtain good soup from meat, we should place it in cold water, and bring this *very gradually* to the boiling-point. The interchange between the juices of the flesh and the external water, which was prevented by the former process, here takes place without hindrance. 'The soluble and sapid constituents of the flesh are dissolved in the water, and the water penetrates into the interior of the mass, which it extracts more or less completely. The flesh loses, while the soup gains, in sapid matters; and by the separation of albumen, which is commonly removed by skimming, as it rises to the surface of the water, when coagulated, the meat loses its tenderness, and becomes tough and hard; and if eaten without the soup, it not only loses much of its nutritive properties, but also of its digestibility.'—Liebig's *Researches on the Chemistry of Food*, p. 128.

Roasting is applied much more to meat than to vegetables. Both in roasting and broiling meat, the first application of heat should be considerable and rapid, so as to form an outer coating of coagulated albumen (just as in boiling), which retains the nutritive matters within the cooked meat. In roasted meat, nothing is removed but some of the superficial fat and the gravy, which is itself an article of food. The effect of roasting on such vegetables as apples and potatoes is to render them more nutritive and digestible than they would be in the raw state, by splitting their starch grains, and rendering them more soluble.

Baking (q. v.) acts in the same manner as roasting, but meat thus cooked is less wholesome, in consequence of its being more impregnated with empyreumatic oil.

Frying is the most objectionable of all kinds of cookery. In this operation, heat is usually applied by the intermedium of boiling fat or oil. Various products of the decomposition of the fat are set free, which are very obnoxious to the stomachs of invalids.

Liebig has shewn that salted meat is, in so far as nutrition is concerned, in much the same state as meat from which good soup has been made. After flesh has been rubbed and sprinkled with dry salt, a brine is formed amounting in bulk to one-third of the fluid contained in the raw flesh. This brine is found to contain a large quantity of albumen, soluble phosphates, lactic acid, potash, creatine, and creatinine—substances which are essential to the constitution of the flesh, which therefore loses in nutritive value in proportion to their abstraction.

The preservation of food requires some notice. Three methods—viz., preservation by cold, preservation by the exclusion of air, and preservation by salting—are noticed in the article Antiseptics. The first is only of comparatively limited application: the second, known as Appert's method, has been successfully used in the English navy for many years; the chief objection to it is its expense: the third method injures, as we have already seen, the character of the meat, and renders it both deficient in nutritive materials, and actually injurious if it forms a principal and continuous article of diet. To these methods we must add preservation by smoking, preservation with sugar, and with vinegar, and preservation by drying. It is well known that meat suspended in smoke loses its tendency to putrefy, the substance from which the smoke derives its antiseptic property being creasote, or some allied body. Smoked meat acquires a peculiar taste, a dark colour, and a somewhat hard consistence; but it retains all its nutritive constituents, and is thus preferable to salted meat. Sugar and vinegar are chiefly employed in the preservation of vegetable products. The most important mode of preserving articles of food, whether animal or vegetable, is by direct drying. Meat is cut up into small slices about a quarter of an inch thick, and vegetables into smaller pieces; they are steamed at a high temperature, so as to coagulate the albumen; and they are then completely desiccated by exposure to a current of very hot dry air. At the conclusion of the process, the slices of meat are quite hard, and present a shrivelled appearance. Dr Marcet (*On the Composition of Food*, 1856, p. 174) speaks in high terms of this method, which he has himself seen in operation in Paris. 'Food thus preserved,' he says, 'whether it be animal or vegetable, has the advantage (1) of remaining in a fresh condition, though freely exposed to the atmosphere for a great number of years, and (2) of being reduced to one-fifth of its original bulk from its having lost all its water.' He adds, that the preserved vegetables resume their bulk when boiled in water, and that they so completely retain their aroma, that it is often difficult to distinguish between soups made with them, and others prepared with fresh vegetables.

The adulteration of food of almost every kind is unfortunately so common a custom, that our limited space will merely allow of our noticing a few of the leading points in regard to it.

Wheat-flour is not unfrequently adulterated with one or more of the following substances—flour of beans, Indian corn, rye, or rice, potato-starch, alum, chalk, carbonate of magnesia, bone-dust, plaster of Paris, sand, clay, &c. The organic matters—the inferior flours and starch—do little or no serious harm; most of the inorganic matters are positively injurious, and of these, alum (one of the commonest adulterations) is the worst. The beneficial action of wheat-flour on the system is in part due to the large quantity of soluble phosphates which it contains. When alum is added, these phosphates are decomposed in the process of making bread, the phosphoric acid of the phosphates uniting with the alumina of the alum, and forming an insoluble compound; the beneficial effect of the soluble phosphates is thus lost.

Arrow-root is adulterated with potato-flour, sago, starch, &c. Out of 50 samples examined by Dr Hassall, 22 were adulterated, and in 10 of the samples there was scarcely a particle of the genuine article.

Sugar of the inferior kinds is occasionally adulterated with flour, gum, starch-sugar, &c. It is oftener, however, impure than intentionally adulterated.

Pepper is adulterated with linseed, mustard-seed, wheat-flour, &c.

Cayenne Pepper is adulterated with red lead, vermilion, red ochre, brick-dust, common salt, turmeric, &c.

Mustard is largely adulterated with ordinary and pea flour, linseed meal, and turmeric; and a little chromate of lead is sometimes added to improve the colour. Dr Hassall submitted 42 specimens of mustard to examination; the whole of them contained wheat-flour and turmeric.

Ginger is frequently adulterated. Out of 21 samples, Dr Hassall found that 15 contained various kinds of flour, ground rice, Cayenne pepper, mustard husks, and turmeric, which in most cases formed most of the so-called ginger.

Out of 26 samples of *mixed spices*, 16 were found by Dr Hassall to contain sago-meal, ground rice, wheat-flour, &c.

Curry powder (q. v.) was found by Dr Hassall to be very commonly adulterated, only 7 specimens out of 26 being genuine. In 8 of the samples red lead was detected. The frequent use of curries may thus often give rise to the disease known as lead-palsy.

The adulterations of *tea*, both by the Chinese and in this country, are too numerous for us to mention. See Hassall's *Adulterations Detected*, pp. 65—104.

Coffee, in its powdered form, is not merely largely adulterated with chicory, but additionally with roasted grain, roots, acorns, saw-dust, exhausted tan (termed croats), coffina (the seeds of a Turkish plant), burnt sugar, and (worst of all) baked horses' and bullocks' liver. In the *Quarterly Journal of the Chemical Society* for April 1856, there is an excellent Report by Messrs Graham, Stenhouse, and Campbell on the mode of detecting vegetable substances mixed with coffee. Even whole roasted coffee is not safe from adulteration, a patent having been actually taken out to mould chicory into the form of coffee-berries.

Cocoa and *Chocolate* are adulterated with flour, potato-starch, sugar, clarified mutton-suet, and various mineral substances, such as chalk, plaster of Paris, red earth, red ochre, and Venetial earth, the last three being used as colouring matters.

The adulterations of *beer*, *wine*, and *spirits* are noticed in the articles devoted to those subjects.

Vinegar is adulterated with water, sulphuric acid, burnt sugar, and sometimes with chillies, grains of paradise, and pyroligneous acid. The English law allows one part of sulphuric acid to 1000 of vinegar, with the view of preserving it from decomposition, but Dr Hassall found that in many cases three or four times the legal amount was present. It appears from evidence taken before the parliamentary committee on adulterations, that arsenic and corrosive sublimate are no uncommon ingredients in vinegar. In connection with vinegar we may place *Pickles.* Dr Hassall analysed 16 different pickles for copper, and discovered that poisonous metal more or less abundantly in *all* of them; 'in three, in a very considerable quantity; in one, in highly deleterious amount; and in two, in poisonous amount.' Preserved fruits and vegetables (especially gooseberries, rhubarb, greengages, and olives) are often also contaminated largely with copper. In these cases, the copper, if in considerable quantity, may be easily detected by placing a piece of polished iron or steel in the suspected liquid for 24 hours, to which we previously add a few drops of nitric acid. The copper will be deposited on the iron. Or ammonia may be added to the fluid in which the pickles or fruit were lying, when, if copper is present, a blue tint is developed. We should be suspicious of all pickles, olives, preserved gooseberries, &c., with a particularly bright green tint.

Milk is usually believed to be liable to numerous adulterations, such as flour, chalk, mashed brains, &c. It appears, however, from Dr Hassall's researches on London milk, that, as a general rule, water is the only adulteration. The results of the examinations of 26 samples were, that 12 were genuine, and that 14 were adulterated, the adulteration consisting principally in the addition of water, the percentages of which varied from 10 to 50 per cent., or one-half water. In the article MILK we shall describe the means of testing the purity of this fluid.

If space permitted, we might extend the list of alimentary substances liable to adulteration to a much greater length. In conclusion, we may remark, that, as a general rule, adulterations of an organic nature, such as flours and starches of various kinds, are best detected by the microscope; while chemical analysis is usually necessary for the detection of mineral adulterations. Dr Hassall's *Adulterations Detected* is a perfect cyclopædia on this subject.

FOOL. See COURT-FOOL.

FOOLS, FEAST OF. The Romans kept the festival of Saturn, in December, as a time of general licence and revelry. During the brief season of the Saturnalia (q. v.), the slave reclined on his master's seat at table, the master waited upon his slave, and society, for the moment, seemed to be turned upside down. The grotesque masquerade survived the pagan creed which gave it birth, and not only kept its place among the Christians, but, in the face of solemn anathemas of fathers and councils, found its way into the ceremonial of the Christian Church. It was called, at different times and places, by many different names, but has latterly come to be best known as the Feast of Fools (*Festum Fatuorum, Festum Stultorum*).

The circumstances of the observance were almost infinitely varied, but it was everywhere marked by the same spirit of broad, boisterous drollery, and coarse but not ill-natured caricature. The donkey played such a frequent part in the pageant that it was often called the Feast of Asses (*Festum Asinorum*). In some places, the ass of Balaam was figured; in others, the ass which stood beside the manger in which the infant Saviour was laid; elsewhere, the ass on which the Virgin and Child fled to Egypt, or the ass on which Jesus rode into Jerusalem. In every instance, there was more or less attempt at dramatic representation, the theatre being generally the chief church of the place, and the words and action of the drama being often ordered by its book of ceremonies. Several rituals of this sort are still preserved. That which was in use at Beauvais, in France, has a rubric ordering the priest when he dismisses the congregation to bray three times, and ordering the people to bray three times in answer. As the ass was led towards the altar, he was greeted with a hymn of nine stanzas, of which the first runs thus:

Orientis partibus,
Adventavit Asinus,
Pulcher et fortissimus,
Sarcinis aptissimus.
Hé, sire Ane, hé!

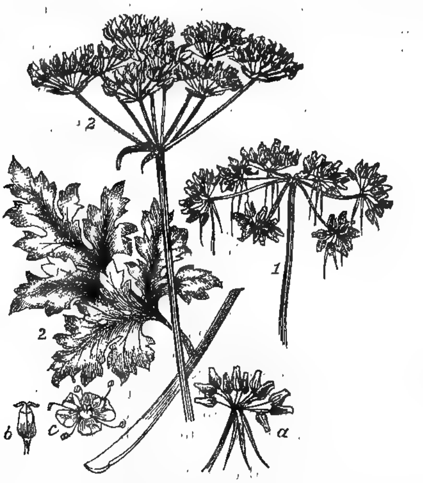
[From the regions of the East—
Blessings on the bonny beast!—
Came the Donkey, stout and strong,
With our packs to pace along.
Bray, Sir Donkey, Bray!]

Where the ass did not come upon the stage, the chief point of the farce lay in the election of a mock pope, patriarch, cardinal, archbishop, bishop, or abbot. These mimic dignitaries took such titles as 'Pope of Fools,' 'Archbishop of Dolts,' 'Cardinal of Numskulls,' 'Boy Bishop,' 'Patriarch of Sots,' 'Abbot of Unreason,' and the like. On the day of their election, they often took possession of the churches, and even occasionally travestied the performance of the church's highest office, the mass, in the church's holiest place, the altar. In some convents, the nuns disguised themselves in men's clothes, chanted mock services, and elected a 'little abbess,' who for that day took the place of the real abbess.

The Feast of Fools maintained itself in many places till the Reformation in the 16th century. At Antibes, in the south of France, it survived till the year 1644, when we have it described by an eye-witness in a letter to the philosopher Gassendi. The scene was, as usual, a church; and the actors, dressing themselves in priests' robes turned inside out, read prayers from books turned upside down, through spectacles of orange-peel, using coal or flour for incense, amid a babblement of confused cries, and the mimic bellowings of cattle, and grunting of pigs.

The history of the Feast of Fools has been treated in several works; the best is the *Mémoire pour servir à l'Histoire de la Fête des Fous*, by Du Tilliot, published at Lausanne in 1741; reprinted at Paris in 1751, and again in the *Recueil des Cérémonies et Coutumes Religieuses de Tous les Peuples*, tome viii. (edit. Prudhomme, 1809.)

FOOL'S PARSLEY (*Aethusa Cynapium*), an umbelliferous plant, very common as a weed in gardens and fields in Britain, and in most parts of Europe, somewhat resembling parsley in its foliage and general appearance, so that serious accidents have occurred from its being mistaken for that herb; it being a poisonous plant, somewhat resembling hemlock in its properties. With the curled variety of parsley it cannot easily be confounded, which is even on other accounts to be preferred; and when in flower it is readily known from every other plant in British gardens by its umbels wanting general involucres, and having partial involucres of three slender leaves hanging down on one side.



1, Fool's Parsley, general umbel; 2, Common Parsley, leaf and general umbel:
a, partial umbel of fool's parsley; *b*, fruit of common parsley; *c*, flower of common parsley.

FOOT is the most common unit of lineal measure all over the world. It has been evidently taken originally from the length of the human foot, and as that varies in length, so does the measure; each country, and at one time each town, having a foot of its own. The three foot-measures that occur most frequently are the Paris foot, or *pied de roi*, the (German) Rhenish foot, and the English. Compared with the French *mètre* (= 3·28090 feet Eng.), they stand thus:

		Mètre.			Inches English.
English foot	=	0·30479	Paris foot	=	12·78912
Paris "	=	0·32484	Rhenish "	=	12·35652
Rhenish "	=	0·31385			

In round numbers, 46 French feet = 49 English feet, 34 Rhen. or Germ. feet = 35 English, and 57 French feet = 59 Rhen. The Russian foot is equal to the English. Almost every German state has a different foot. The Rhenish foot is that used in Prussia. The longest foot occurring is the old Turin foot = 20 inches English. Many local feet are only about 10 inches. The foot has almost uniformly been divided into 12 inches; the inch into 12 lines, often into tenths. The French *pied usuel* is the third part of the mètre. See YARD, METRE.

FOOT, in Verse. See METRE, VERSE.

FOOT, STRUCTURE OF THE. In describing the structure of the foot, it is expedient to commence with a brief notice of the bones which occur in it. In man, these are 26 in number, and are arranged in three natural groups—viz., the tarsal bones, which are the hindermost; the metatarsal bones, which occupy the middle portion; and the phalanges of the toes anteriorly. The tarsal bones, seven in number, are short and thick, and form the heel and the hinder part of the instep. The uppermost (see fig. 1) is called the *astragalus*, from its supposed resemblance to the dice used by the Romans. Above, it is articulated or is jointed with the two bones of the leg, the *tibia* and *fibula*, and through these bones the whole weight of the body is thrown upon the two *astragali.* Behind, it is connected with and rests upon the *os calcis*, or heel-bone, which is the largest bone of the foot. Immediately in front of it, and supporting it in this direction, is the *scaphoid* or boat-like bone. In front of the scaphoid bone are the three *cuneiform* or wedge bones; and on the outer side of the cuneiform bones, and in front of the os calcis, is the *cuboid* bone. We see from the figure that the front row of tarsal bones is composed of the three cuneiform bones on the inner side of the foot, and of the cuboid bone externally. There are five metatarsal bones passing forward, one for each toe. Each cuneiform bone is connected with one, and the cuboid bone with two, of these metatarsal bones. Behind, they are close together, but as they run forwards, they diverge slightly from one another, and their anterior ends rest upon the ground, and form the *balls* of the toes. They constitute the forepart of the instep. The remaining bones are those of the toes, and are named the *phalanges*, each toe having three of these bones, excepting the great toe, which has only two. (A similar law holds for the bones of the hand, each finger having three phalanges, but the thumb only two.)

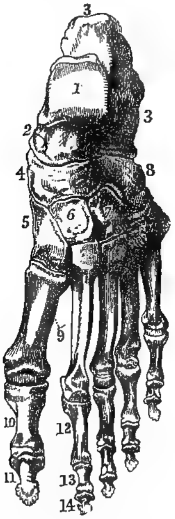


Fig. 1.

The dorsal surface of the left foot.

1, the astragalus, its upper articular surface; 2, its anterior extremity, which articulates with (4) the scaphoid bone; 3, the os calcis, or heel-bone; 4, the scaphoid bone; 5, the internal cuneiform bone; 6, the middle cuneiform bone; 7, the external cuneiform bone; 8, the cuboid bone; 9, the metatarsal bones of the first and second toes; 10, 11, the first and second phalanges of the great toe; 12, 13, 14, the first, second, and third phalanges of the second toe.

The instep is composed of the seven tarsal and the five metatarsal bones, which are so arranged and connected (see fig. 2) as to form an arch from the extremity of the heel-bone to the balls of the toes. This is called the plantar arch, from *planta*, the sole of the foot. The astragalus forms the summit or keystone of this arch, and transmits the weight which it receives posteriorly to the heel, and anteriorly to the balls of the toes. This figure exhibits the arrangement of the fibres and laminæ in the interior of the bones, and shews that the greater number of them, in each bone, follow the directions of the two pillars of the arch, and thus give the greatest strength to the bones in the directions in which it is most required.

The bones, where they articulate with one another, are covered with a tolerably thick layer of highly elastic cartilage, and by this means, together with the very slight movements of which each bone is capable, a degree of elasticity is given to the foot, and consequently to the step, which would be altogether wanting if the plantar arch were composed of one single mass of bone. This elasticity is far greater in the anterior pillar of the arch, which is composed of five comparatively long bones sloping gradually to the ground, than in the posterior pillar, which is short, narrow, and composed of a single bone, which descends almost vertically from the ankle to the ground. Hence, in jumping from a height, we always endeavour to alight upon the balls of the toes, and thus break the shock which we should feel if, by accident, we descended upon the heels.

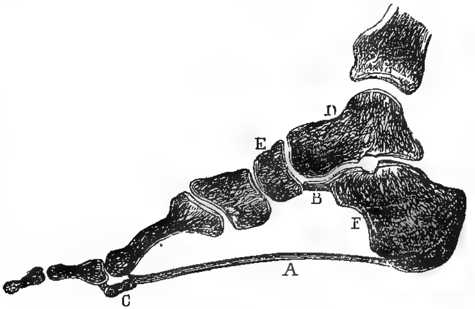


Fig. 2.*

This figure represents a section through the lower end of the tibia, and through the astragalus D, the heel-bone F, the scaphoid bone E, the internal cuneiform bone, and the bones of the great toe; A represents the plantar ligament, and B the interior calcaneo-scaphoid ligament passing from the heel-bone, F, to the scaphoid, E; C is one of two small bones called sesamoid bones, usually found at the ball of the great toe. The lines shew the disposition of the laminæ or plates of which the various bones are composed. The clear line along the contiguous edges of the bones represents the cartilage.

A reference to any standard work on anatomy (see, for example, Gray's *Anatomy*, pp. 178—184) will shew that the ligaments which unite these bones to one another, and by which the movements of each bone upon the others are limited, are very numerous. We shall merely notice two of these ligaments, selecting those whose action is especially obvious in maintaining the shape of the plantar arch. One, the *plantar ligament* (A, fig. 2), of great strength, passes from the under surface of the heel-bone, near its extremity, forwards to the ends of the metatarsal bones, according to Dr Humphry (*The Human Foot and the Human Hand*, 1861, p. 25). Most anatomists do not trace it quite so far forwards. 'In other words' (we quote from Dr Humphry's volume), 'it extends between the lowest points of the two pillars of the arch, girding or holding them in their places, and preventing their being thrust asunder when pressure is made upon the key-bone (D), just as the "tie-beam" of a roof resists the tendency to outward yielding of the sides when weight is laid upon the summit. The ligament, however, has an advantage which no tie-beam can ever possess, inasmuch as a quantity of muscular fibres are attached along the hinder part of its upper surface. These instantly respond to any demand that is made upon them, being thrown into contraction directly the foot touches the ground; and the force of their contraction is proportionate to the degree of pressure which is made upon the foot. In addition to its office of binding the bones in their places, the ligament serves the further purpose of protecting from pressure the tender structures—the blood-vessels, nerves, and muscles—that lie above it in the hollow of the foot. Another very strong ligament (B, in the figure) passes from the under and fore part of the heel-bone (F) to the under parts of the scaphoid bone (E). It underlies and supports the round head of the astragalus, and has to bear a great deal of the weight which is transmitted to that bone from the leg. It possesses a quality which the ligament just described, and most ligaments have not—viz., elasticity. This is very important, for it allows the head of the key-bone (D) to descend a little, when pressure is made upon it, and forces it up again when the pressure is removed, and so gives very material assistance to the other provisions for preventing jars, and for giving ease and elasticity to the step.'—Humphry, *op. cit.*, pp. 25, 26.

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* This, and several of the following diagrams, have been copied, with Dr Humphry's permission, from *The Human Foot and the Human Hand.*

The spot over which the ligament B extends is the weakest in the foot, the astragalus being there unsupported by any bones; additional support is, however, afforded when it is most required by the tendon of a strong muscle, the *posterior tibial* (fig. 3, B), which passes from the back of the tibia (the chief bone of the leg) round the inner ankle, to be inserted into the lower part of the inner surface of the scaphoid bone. It not unfrequently happens that the astragalus, being either insufficiently supported, or from its being overweighted, descends slightly below its proper level, causing a lowering of the arch, and a flattening of the sole of the foot. The defect, when slight, is known as 'weak ankle;' when more decided, it is termed 'flat-foot;' and in extreme cases, the bone may descend to such an extent as even to render the inner side of the foot convex, when it naturally should be concave.

The deformity of which we are speaking is of such great practical importance, that we shall add a few words about its most common causes.

There are two periods of life at which *flat-foot* is especially liable to occur: 1st, in infancy, if the child be put upon its feet before the bones and ligaments—especially the latter—are strong enough to bear its weight; and 2dly, about the age of fourteen—a period at which growth is very quick, and the body consequently attains a considerable and rapid augmentation of weight. If young persons of this age are obliged to be a great deal on their feet, and perhaps additionally to carry weights (as, for example, butchers' and bakers' boys, and young nursemaids), the chances that flat-foot will occur are increased.

We now come to the movements of the foot upon the leg. We see here a striking combination of variety of movement with general security. This combination is effected by the harmonious action of three joints, each of which acts in a direction different from the others.

The first of these joints is the ankle-joint, which is formed by the bones of the leg—the tibia and fibula—above, and the astragalus below. By this joint, the foot is bent or straightened on the leg. The second joint is between the astragalus and the heel-bone, and it permits the foot to be rolled inwards or outwards; while the third joint is between the first and second row of tarsal bones—namely, between the astragalus and heel-bone behind, and the scaphoid and cuboid bones in front, and allows the degree of curvature of the plantar arch to be increased or diminished within certain limits. The following is the order in which the movements of these three joints occur: the raising of the *heel* (by the first joint) is accompanied by a rolling of the foot *in*wards (by the second joint), and by an increased *flexure* of the plantar arch (by the third joint); and the raising of the *toes* is accompanied by a rolling of the foot *out*wards and a *straightening* of the sole. See Humphry, *op. cit.*, p. 42.

The joints, however, merely allow of movements; they do not effect them: this is the special function of the muscles; and each of the three movements we have indicated is effected by special groups of muscles. The first series of movements is mainly effected by three muscles: viz., (1) the *muscles of the calf* (fig. 3, A), attached above to the bones of the thigh and leg, and below by the *Tendo Achillis* to the heel-bone; (2) the *posterior tibial* (fig. 3, B), attached above to the tibia, and below by its tendon to the scaphoid bone, and (3) the *short fibular* (fig. 4, C), attached above to the fibula, and below by its tendon to the outer metatarsal bone. The calf-muscles, whose tendon is inserted into the heel-bone, are large and very powerful, for in raising the heel, they have to raise the weight of the body. The other two muscles, the posterior

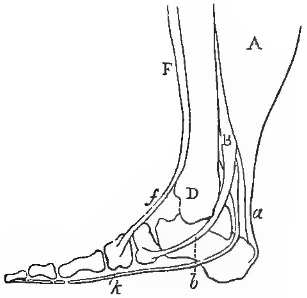

Fig. 3.

This figure represents some of the muscles and tendons seen on the inner side of the leg and foot.

A, the gastrocnemius and soleus muscles, forming the muscles of the calf; *a*, the Tendo Achillis: B, the posterior tibial muscle; *b*, its tendon: D, the inner ankle: F, the anterior tibial muscle, attached above to the front of the tibia, below to the internal cuneiform bone; *k*, the flexor tendon of the great toe.

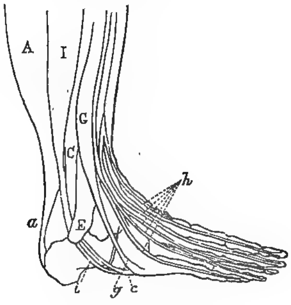

Fig. 4.

This figure represents some of the muscles and tendons on the outer side of the leg and foot.

E, lower end of fibula, forming the outer ankle; C, the short fibular muscle, attached above to the fibula, and below by its tendon (*c*) to the outer metatarsal bone; I, the long fibular muscle, its tendon (*i*) running behind the outer ankle and under the instep to the metatarsal bone of the great toe; G, the anterior or third fibular muscle, attached above to the fibula and below by its tendon (*g*) to the outer metatarsal bone; *h*, the extensor tendons of the toes.

tibial and the short fibular, turn round the inner and the outer ankle respectively, and are inserted into the inner and the outer edges of the instep; the former being attached to the scaphoid, and the latter to the outer metatarsal bone. They not only assist to raise the ankle, but support it laterally. The muscle whose tendon is on the inner side of the foot (the posterior tibial), effects the two movements which are associated with the raising of the heel-bone, namely, the turning of the foot inwards, and the increased flexure of the arch.

The second series of movements—the raising of the toes, the turning of the foot outwards, and the straightening of the sole—are effected by two muscles, the *anterior tibial* (fig. 3, F) and the *third fibular* (fig. 4, G), whose tendons pass, one in front of the inner ankle, and the other in front of the outer ankle, to the corresponding edges of the instep, and are inserted into the internal cuneiform and the outer metatarsal bones. These muscles are direct flexors of the tarsus upon the leg; the former raising the inner, and the latter the outer border of the foot.

Another point in the anatomy of the foot that requires notice, is the mode of union of the metatarsal with the tarsal bones. In these joints in the fourth and fifth toes a slight revolving motion can take place, which probably enables the outer metatarsals to adapt themselves to inequalities of the ground, and to equalise the distribution of the weight which is thrown upon the foot; while, in the corresponding joints of the three inner toes, scarcely any motion can occur—a provision by which additional strength is given to the inner side of the foot upon which the weight of the body most directly falls.

The skin of the sole is very tough and strong; and intervening between it and the bones and long plantar ligament is a thick pad of fat, which acts the part of an air or water cushion in defending the adjacent parts from injurious pressure, and in deadening the jars and shocks that would otherwise be felt in leaping, &c.

A few remarks on the subject of shoes may here be added. The shape of the sole of the natural foot is shewn in fig. 5, while the shape after the prolonged use of a badly made shoe is given in fig. 6. In the foot in its normal state, the great toe is seen to be free from the others, and the line of its axis prolonged backwards, passes through the centre of the heel; while in the foot distorted by the use of the shoe, the line of the great toe is quite altered, and the toes generally—not being able to find room side by side—overlap each other, and lose their separate and individual actions; corns, bunions, and ingrowing toe-nails being the natural consequence of this maltreatment. Professor Meyer, of Zurich, has drawn attention to the bad treatment which the foot receives from ordinary shoemakers, in a pamphlet, translated by Mr Craig, and entitled *Why the Shoe Pinches; a Contribution to Applied Anatomy.* He especially points out that the great toe should be allowed to have its normal position, and this can be done by making the inner edge of the sole incline *in*wards, instead of *out*wards, from the balls of the toes. The accompanying figure (7) gives the outline of a shoe designed under Dr Meyer's superintendence, and shews the difference between it and the usual shape; the latter being indicated by the dotted outline. Dr Humphry, from whose admirable work we have drawn much of this article, while fully according in Meyer's views, additionally protests against high heel-pieces, as tending to make the step less steady and secure, to shorten it, and to impair the action of the calf-muscles; a high heel-piece, moreover, places the forepart of the foot at a lower level than the heel; the weight is thus thrown too much in the direction of the toes, and they are thrust forwards and cramped against the upper leather of the shoe.

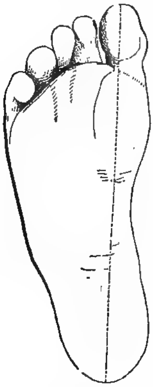
Fig. 5.

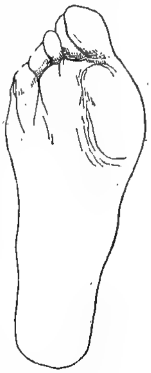
Fig. 6.

The subjects of WALKING, RUNNING, and JUMPING are noticed in the article MOVEMENTS, ANIMAL.

If we compare the human foot with the feet of other mammals, we find that it presents certain peculiarities, all of which have reference to man's erect posture. The chief peculiarities are—1. The greater relative size of the tarsal bones, as compared with the other bones of the foot, and the more perfect formation of the plantar arch, which is higher and stronger than in any of the lower animals. Strength and elasticity are thus combined in the human foot in the highest degree. 2. The great toe is remarkable in man for its size and strength, and for the firm manner in which its metatarsal bone is joined to the other bones, so as to render it the main support to the foot. 3. If we compare the human foot with that of the gorilla or any other anthropomorphous ape, we see that the toes are short and small in man in relation to the other parts of the foot, while in the gorilla the toes form the greater part of the foot. Indeed, a reference to fig. 8 shews that in this animal (and the same is the case in all the *genera* of apes and monkeys) the organ in question is rather a *hand* than a *foot*, and hence the term *quadrumanous*, as applied to this class of animals. There is scarcely any plantar arch, and

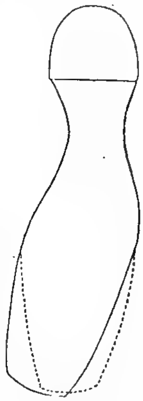
Fig. 7.
A shoe designed by Dr Meyer, the dotted outline being the usual shape.

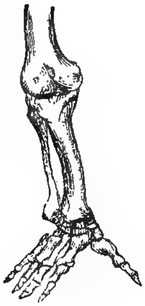
Fig. 8.
Foot of Gorilla.

the weight of the body bears chiefly on the outer edge of the foot; the digits are long and strong, and the inner one diverges so as to form a thumb rather than a great toe.

It remains to notice some of the most marked varieties of form which the bones of the foot present in mammals. In the following group of figures, the same letters are attached to the same bones. Thus, *a* marks the astragalus; *cl*, the calcaneum or heel-bone (the posterior projection of which forms the hock of the horse); *s*, the scaphoid; *b*, the cuboid; *ce*, the ecto-, or outer, *cm*, the meso-, or middle, and *ci*, the ento-, or internal cuneiform. Now, as a general rule in all mammalia, the ecto-cuneiform supports the third or middle of the five toes when they are all present, the meso-cuneiform the second, and the cuboid the fourth and fifth. Bearing in mind this law, we see that the large bone in the horse, known as the cannon-bone, which is articulated to the ecto-cuneiform, *ce*, is the metatarsal of the third toe, to which are articulated the three phalanges of that toe, the last phalanx, 3, being expanded to form the hoof. The small bone,* popularly known as the splint-bone, and articulated to the meso-cuneiform, is the rudimentary or stunted metatarsal of the second toe, 2; and the outer splint-bone, articulated to the cuboid, is the rudimentary metatarsal of the fourth toe, 4; so that in the horse we have only one toe, the third, sufficiently developed to reach the ground, with mere traces of a second and fourth toe on either side.

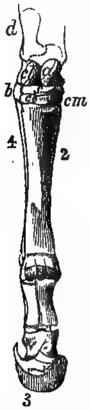

Fig. 9.—Horse.

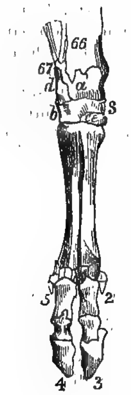

Fig. 10.—Ox.

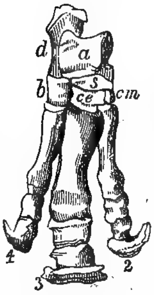

Fig. 11.
Rhinoceros.

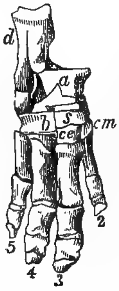

Fig. 12.
Hippopotamus.

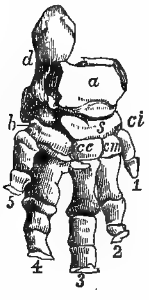

Fig. 13.
Elephant.

In the foot of the ox, the cuboid, *b*, is relatively larger than in the horse, and is equal in size to the ecto-cuneiform, *ce*. The cannon-bone articulates with both these tarsal bones, and hence answers to the metatarsal bones of both the *third* and *fourth* digits; it is accordingly found to consist of two distinct bones in the fœtus; and in the adult it is divided internally into two cavities, and its original separation is marked out by an external elongated ridge. At the lower end are two distinct joints for the phalanges of the third and fourth toes. While in the horse we had the rudiments of the *upper* parts of two toes (the second and fourth), in the ox we have the rudiments of the *lower* parts or phalanges of two toes (the second and fifth), forming the 'spurious hoofs,' and marked 2 and 5 in the figure. In the rhinoceros there is one principal toe (the third), as in the horse, with the second and fourth toes in a less developed state; while in the hippopotamus there are two principal toes (the third and fourth), as in the ox, with the second and fifth toes not fully developed. In the elephant, there is a fifth digit added, answering to our great toe, and articulating with an ento-cuneiform bone, so that in the foot of this animal we have all the bones occurring in the human foot.

Professor Owen, to whose works we are indebted for these remarks, concludes from these and similar observations that the course of the simplification of the five-toed foot is, first, a diminution and removal of the innermost toe; next, of the outermost; then, of the second; and lastly, of the fourth; the third or middle toe being the most constant and (in the lower animals) the most important of the five.

FOOT, in Music, is a term made use of in the same way as in poetry, denoting a short melodic figure of notes with only one accent. Foot is also now beginning to be used in speaking of the pitch of sounds. The Germans have always used the word *Fusston* in representing the pitch of the different stops of an organ, such as *Principal* 16 F., 8 F., or 4 F., &c., which practice is now being introduced into English organs, and is found very useful to organists. The pitch of the stop is fixed according to the length of the lowest C pipe. See ORGAN-BUILDING.

FOOTA-BONDOU. See BONDOU.

FOOTBALL. This game has long been a favourite throughout the British Isles; and as a winter game in certain places, such as Rugby, Eton, Winchester, and the university of Glasgow, it is more popular than any other. A large park or common is best suited for the game, one of the most attractive features of which is, that it may be simultaneously enjoyed by great numbers of players irrespective of age or size. Two 'goals'—consisting each of a couple of upright poles, ten, twelve, or even eighteen feet high, and a cross-bar on top—are erected opposite each other, at any distance that may be agreed upon, the game being carried on in the intervening space. Two side-lines, called goal-lines, are drawn from each of the goals. The players are chosen by two captains, who arrange their men in the field, and keep them to their respective sides, and whose duty it is besides to see that fair play is carried on. After each captain has posted a trustworthy member of his side at the goal as 'keeper,' the players on each side are duly placed, and the game is begun, by the ball being kicked towards one of the goals from a point midway between each. Whichever side contrives to kick the ball *through* the adversaries' goal, reckons either 'game' or one towards it, though, where the players are equally matched, and the goals well defended, the play may last many hours without a single score being made. After each goal has been made, the players usually change ends, so that no undue advantage be derived by one side from sloping ground, favouring wind, &c.

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* The bone is not shewn in the figure.

The ball generally used is made of an ox-bladder covered with strong leather; india-rubber balls are considered inferior.

With popular games, such as cricket, &c., the rules laid down are for the most part binding all over the country; the same remark, however, does not apply to football, as each district seems to have rules of its own. Thus, those of Rugby, Winchester, Eton, &c., all differ materially, though the general methods of playing the game are the same.

The following, which we borrow from *Every Boy's Magazine*, No. 1 (London, Routledge), in which there is an excellent treatise on the game, are sufficient for general purposes. 1. The game being essentially *foot*-ball, no player may take up the ball from the ground. 2. If a player can catch the ball in the air, he may take a hand-kick without the other side being permitted to interfere. (A hand-kick consists in dropping the ball from the hands, and kicking it on its fall.) 3. If such player shall drop the ball accidentally, or in any way touch the ground with it, the opposite side may attack it. 4. If the ball pass outside or over the goal, and beyond the goal-line, the junior player of the side which drove it over shall fetch the ball, stand twelve paces to the right of the centre point (mid-way between the goals), and throw it gently to the centre without favour to either side. This rule is used because it sometimes happens that irritable players, finding the enemy's goal too well defended, wilfully kick the ball far beyond it, hoping to exhaust their opponents, and thus needlessly prolong the game. It is a mark of bad play, as well as unmanliness, to drive a ball where it can be of no use, and the penalty deprives the offending side of the junior player while he throws in the ball, and thus has the effect of deterring them from repeating the error. 5. Any kicking, except at the ball, is prohibited. 6. The ball must be *kicked* through the goal, not struck or thrown, or touch any part of any player of the same side, except the foot of him who kicks it; otherwise, the ball is fetched back, as in rule 4.

FOOTE, SAMUEL, actor and writer of comedy, was born of a good family at Truro, in Cornwall, 1720. He was educated at Worcester College, Oxford, and about 1740 entered the Temple; but after a career of 'pleasure' extending over four years, in the course of which he managed to dissipate a couple of fortunes which had been left him, he turned his attention to the stage as a means of support, and in 1744 made an unsuccessful début in the character of Othello. In 1747, he opened the Haymarket Theatre—where he was at once director, actor, and dramatic author—with a piece entitled *Diversions of the Morning*. In this and other pieces, he introduced well-known living characters, and, by his admirable powers of mimicry, succeeded in drawing large audiences, till the theatre was closed by order of the magistrates. After 1752, he continued to perform alternately in London and Dublin. In 1766, he broke his leg by a fall from his horse, and amputation was found necessary. He, however, recovered his health and spirits, and even turned the incident to account on the stage, composing parts expressly adapted to his own state. He died at Dover, 21st October 1777. A variety of comic anecdotes respecting F. are given in Cooke's *Memoirs of Samuel Foote* (London, 1805). His conversation must have been inimitably comical. Dr Johnson, who had a power of refusing to be pleased against his will greater than most men, met F. for the first time at Fitzherbert's, and assumed his most ursine manner; but it was no use: 'I was obliged,' he says, 'to lay down my knife and fork, throw myself back in my chair, and fairly laugh it out. Sir, he was irresistible.' His dramatic works, of which the best are *An Auction of Pictures*, *The Minor*, *The Englishman Returned from Paris*, *The Bankrupt*, *The Liar*, and *The Mayor of Garratt*, have been frequently published, but never in a complete form. Compare Forster's essay in the *Quarterly Review*, 1854.

FOOT-GUARDS, the flower of the British infantry, and the garrison ordinarily of the metropolis, comprise three regiments, the Grenadier, Coldstream, and Scots Fusilier Guards, in all seven battalions, and 6307 officers and men of all ranks. For their history and a more particular description, see the general article GUARDS.

FOOT-POUND is the unit by which the *work done* by a force is estimated; thus (taking 1 lb. and 1 foot as the units of weight and distance), if 1 lb. be raised through 1 foot, the *work done* is equal to 1 foot-pound; if 10 lb. be raised 9 feet, the *work done* is 90 foot-pounds; and generally, if W represent the *work done*, P the *weight in pounds*, and h the *height in feet*, then W (in foot-pounds) $= Ph$.

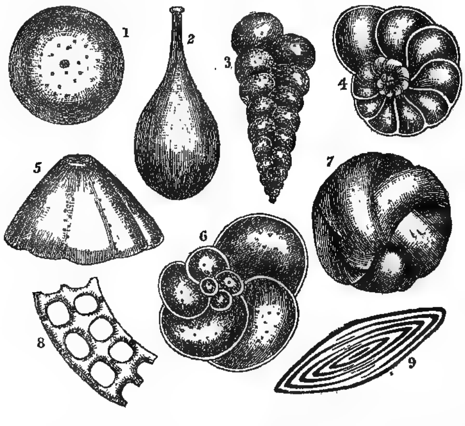
FOOT-PRINTS. See ICHNOLOGY.

FOOT-ROT amongst sheep is of two varieties, the commoner consisting of an inordinate growth of hoof, which, at the toe, or round the margin, becomes turned down, cracked, or torn, and thus affords lodgment for sand and dirt. Insufficient wearing of the hoof is the obvious cause, and hence the prevalence of foot-rot in soft rich pastures, and especially amongst sheep previously accustomed to bare, rough, or upland walks, where the hoof is naturally worn down by the greater amount of walking necessary to procure sustenance. Taken in time, when lameness is first apparent, and before the hoof is cracked, and the foot inflamed, a cure rapidly follows the careful paring of the superfluous and diseased hoof; indeed, further treatment is scarcely necessary, unless any of the vascular parts have been laid bare, when a little tar may be applied as a mild astringent and protection from flies. When, from inattention or neglect, the hoof is separated from the sensitive parts beneath, when ulcers appear on the sole, or proud-flesh springs up, active astringents or mild caustics are necessary. The shepherd's old favourite butter of antimony, diluted with an equal quantity of tincture of myrrh, is a good remedy when cautiously and temperately used. A convenient paste, which in inexperienced hands is safer than a fluid caustic, may be made with equal weights of flowers of sulphur and finely powdered sulphate of copper, rubbed up to the needful consistency with lard or oil. Many have great faith in a mixture of the salt of copper with gunpowder and lard.—The second and more troublesome variety is allied to what is termed *foul* in the foot; instead of commencing at the ground surface, it begins in the interdigital space, appears to depend upon constitutional rather than local causes, and frequently occurs along with the other variety, but, unlike it, occasionally becomes contagious. The foot is hot, tender, and swelled around and immediately above the coronet. There are ulcerations in the interdigital space, and the swelling, and subsequently the sprouting of proud-flesh, cause a separation of the toes. When the tenderness and heat are great, poultices are advisable; but in the milder cases and earlier stages, the parts should be well washed with a solution containing to the pint of water half an ounce each of sulphuric acid and oil of turpentine.

When ulcers appear, they must be touched with lunar caustic, or dressed with the paste already recommended.

FORAGE (from Fr. *fourage*, a contraction of the barbarous Latin *fodderagium*, taken in its turn from the Gothic *fo-dur*, fodder), hay, straw, and oats supplied to horses of officers and soldiers in the army. Where troops are together, the provision of forage devolves on the commissariat: officers of the staff, &c., who are entitled to horses, but whose duties are at stations where bodies of horse are not collected, receive a money allowance, in lieu of forage in kind, varying according to the place and price of provender, but usually about 1*s.* 10*d.* to 2*s.* per horse per day. When a soldier is *en route* away from his regiment, the innkeeper with whom he stops is bound, under the Mutiny Act, to provide his horse with the specified ration of forage—viz., 10 lbs. oats, 12 lbs. hay, and 8 lbs. straw, for the payment of 1*s.* 9*d.* a day, which must also include stabling.

FORAMINI'FERA, a group of marine animals of very low organisation, consisting of a gelatinous substance enclosed in a shell, which is generally calcareous, either simple or divided into chambers variously arranged, and pierced with pores or passages (*foramina*, whence the name), through which long delicate processes of the soft animal are protruded, but for what purpose is not very well known, whether to seize food, to imbibe nutritive fluid, for locomotion, or for all these purposes. Most of the species are minute, although one of more than two inches in diameter has been found in Borneo, and fossil forms approaching to this size are well known under the name of Nummulites (q. v.), from their resemblance to coins. The existing species are very numerous, and have been distributed into many genera. They are found among sea-sand, and among all the dredgings of deep water. The fossil species are still more numerous, and constitute great part of some calcareous rocks, as of chalk. The F. are of very beautiful forms. Some of the simple ones are orbicular, some curiously flask-shaped; those in which the animal is divided into segments, and the shell consequently chambered, sometimes have the segments arranged in a straight line, sometimes spirally, sometimes alternately, &c. The great resemblance of some of the convoluted chambered shells of the F. to the shells of the genus *Nautilus*, led Linnæus and many naturalists to rank them with that genus, and the F. were reckoned among the most highly organised molluscs, a place from which comparatively recent discoveries have completely removed them. They are now regarded as more nearly related to Sponges and to such animals as the *Proteus* or *Amœba.* 'The *Foraminifera* are evidently composite fabrics evolved by a process of continuous gemmation, each gemma remaining in connection with the body by which it was put forth, and according to the plan on which this gemmation takes place will be the configuration of the shell.'—Rymer Jones. Reproduction takes place by the detachment of minute granules in great numbers, and is apparently accompanied with the death of the parent. See PROTOZOA.



Foraminifera:

1, Orbulina Universa; 2, Lagena Striata; 3, Textilaria; 4, Operculina; 5, Faujasina; 6, Rosalina Globularis; 7, Cassidulina; 8, Part of two chambers of an Orbiculina; 9, Vertical Section of fossil Nummulite.

Fossil Foraminifera. The earliest records of this order yet observed are in sandstones near St Petersburg, belonging to the Lower Silurian measures. Scattered through these sandstones are numerous green grains, which have been shewn by Ehrenberg to contain, in their interior, silicious casts of shells similar to the recent genera *Guttulina* and *Textularia.* Forms, apparently referrible to the last genus and to *Fusulina*, constitute a large portion of some beds of carboniferous limestone in Russia, and also in the United States. Among the Secondary rocks, and especially in the Chalk, foraminifera are very abundant. Chalk, indeed, is composed almost entirely of the perfect or broken shells of *Rotalia*, *Spirulina*, *Textularia*, &c. (see CHALK). They are not more numerous in the Tertiary strata, but here they attain an enormous size—gigantic compared with any that preceded them, or with recent forms. Vast beds of limestone occur on the borders of the Mediterranean, composed almost entirely of these large forms. See NUMMULITE and NUMMULITIC FORMATION.

FORBES, DUNCAN, of Culloden, a celebrated Scottish politician of the 18th c., and Lord President of the Court of Session, was born either at Culloden or at Bunchrew—for the family possessed both estates—in the neighbourhood of Inverness, on the 10th November 1685. In 1704, the year that his father died, F., then a lad of 19, commenced his legal studies in Edinburgh; but the following year he removed to Leyden, then the great school for Scottish lawyers of revolution principles, where he studied for two years with the greatest diligence. In addition to the knowledge of the civil law, which was no doubt the principal object of his residence at Leyden, we are told that he made considerable progress in Hebrew and several other Oriental languages. On his return from Leyden, F. was called to the bar, and almost immediately after appointed sheriff of Midlothian—a promotion the rapidity of which is somewhat inconsistent with modern usages. He rose rapidly into practice and into political influence through his connection with the Great Duke of Argyle, then in the zenith of his power, to whom he was united by family ties, and of whose estates he acted as a sort of manager. He married Mary Rose, the daughter of the Laird of Kilravock, a woman of beauty and accomplishment, to whom he is said to have been devotedly attached. She died shortly after their marriage, leaving him an only son, John, who eventually succeeded to his estate, but did not inherit his abilities. During both of the rebellions, Duncan F. acted a prominent part on the side of the Hanoverian government. In 1715, he was in the north, actively engaged in opposing the rebels, along with his elder brother John, who is said to have expended £3000 on the royal cause, not one shilling of which was ever repaid him. But on this, as on all other occasions, Duncan's partisanship was of the most moderate kind. After the suppression of the rebellion, he was opposed to the project of carrying the prisoners out of Scotland, to be tried by English juries, and he wrote to Lord Islay, when he heard that it was proposed to appoint him lord advocate, that he should certainly decline that office. He wrote to his brother, proposing a subscription for the comfort of the prisoners. 'It is certainly Christian,' he said, 'and by no means disloyal, to sustain them in their indigent state till they are found guilty.' To the forfeitures also he was opposed, on grounds of policy as well as of humanity. The only effect of his moderation was to bring suspicion on his own loyalty. But he was too important for his promotion to be arrested. In 1716, he was appointed depute to the lord advocate; in 1722, he was returned to sit in parliament for the Inverness district of burghs; and in 1725, he was lord advocate. He was not distinguished as a debater, but he was largely employed at this period of his career in appeal cases, and he enjoyed the friendship of Sir Robert Walpole, Lyttleton, Mansfield, and Hardwick. He seems even to have penetrated the literary circles in which Swift, Pope, and Arbuthnot were the ruling stars. In 1734, his brother John—Bumper John, as he was called—died, and he succeeded to the estates of the family. In earlier life, Duncan partook of the convivial habits for which his family was distinguished, in an age that was famous for deep potations. Mr Burton records various anecdotes illustrative of his powers in this direction, but he abandoned the practice when his health began to suffer, and devoted himself to more serious if not more onerous duties. During many subsequent years, he in no insignificant degree ruled the destinies, and contributed to the dawning prosperity of Scotland by fostering and developing her internal resources. His policy was to extinguish the rebellion by gaining over the Jacobites to the government. The purity and uprightness of F.'s character were subjected to a severe test. His whole correspondence during these troubled times came to light some seventy years after his death; and though few men ever wrote or were written to with less idea of publication, 'we have not,' says Mr Chambers (*Biographical Dictionary of Eminent Scotsmen*), 'to detect a single one of his advices or proceedings, by the exposure of which even a private gentleman of the most delicate honour, and the most reasonable views, would have cause to feel a moment's uneasiness.' Having freed himself from the shackles of party, his great object was to improve the trade and agriculture of the kingdom. But his views of political economy were not greatly in advance of his time; for in order to encourage the use of malt, he presented to the government a long and detailed scheme for preventing, or rather for punishing the use of tea. F. was appointed President of the Court of Session in 1737; but he still continued his interest in the general improvement of the country. Though he was aware of the character, and, in general, of the designs of the Jacobites, the rebellion of 1745 took the President by surprise. But he was no sooner aware of the danger than he hastened to the north, as he had done on the occasion of the former outbreak, and by his presence and the influence which he possessed in his own district, did much to counteract the proceedings of the rebels. Lovat, as is well known, betrayed both him and the government, and actually made an attack on Culloden House, from which he was beaten off with great spirit by the President and his people. When the rebellion spread, he was forced to abandon his house, and take refuge in the island of Skye, where he remained till after the battle of Culloden. On his return, in place of reaping the fruits of his services, he was regarded with jealousy and aversion by the government. Even the large sums of money which he had advanced were never repaid him; and it is said that the ingratitude of the government, coupled with the perfidy of many of his friends and neighbours, who had changed sides more than once during this miserable affair, weighed so heavily on his spirits as to shorten his life. He discharged his judicial duties, however, with great zeal and ability till within a month of his death, which took place on December 10, 1747. There is a beautiful portrait of the Lord President F., who was a man of great elegance of person and manner, in the Parliament House in Edinburgh. The most recent and complete biography of Forbes is that of Mr Burton in his Lives of Simon Lord Lovat and Duncan Forbes, 1848.

FORBES, EDWARD, an eminent naturalist, was born at Douglas, Isle of Man, February 12, 1815, and died in Edinburgh, November 18, 1854. He received a desultory and imperfect education in early life, in consequence of ill health; but when he left home at the age of 16, he had already possessed himself of a very considerable amount of knowledge in the departments of botany, zoology, and geology. In 1831, F. went to London, with the intention of becoming a student at the Royal Academy; but although he evinced much readiness in drawing, his artistic talents were not sufficiently marked to hold out any prospect of success in the event of his making art his profession; and he therefore determined to turn his attention to medicine, and, with this view, entered the university of Edinburgh. In 1836, he finally relinquished his special medical studies, to devote himself exclusively to the natural sciences. In 1836—1837, he attended lectures at Paris, where he studied under Geoffroy St Hilaire, Jussieu, and De Blainville, while he at the same time availed himself with diligence of all the advantages afforded to students by the museums and libraries of Paris. From the first year of his college life, F. had spent his summer vacations in rambles over various parts of Great Britain, or in excursions on the continent, and the results of the observations which he made during these tours, which were published by him either in the form of separate works, or in the pages of current scientific journals, sufficiently attest his diligence as an observer, and his exact appreciation of analogies and differences of forms. F. may almost be regarded as the originator of the use of the dredge, which he employed with equal success in investigating the marine fauna of our own seas, and of the Mediterranean and the Ægean. In 1841, he joined the surveying ship *Beacon*, as naturalist, and accompanied that vessel during the survey of a part of Asia Minor, and co-operated in the exploration of many of the Xanthian cities. On his return to England in 1843, he found that he had, during his absence, been elected to the chair of botany, King's College, London. He was soon afterwards named curator of the Geological Society; and from that period till his removal to Edinburgh, he remained in London, living in a vortex of scientific labours and literary work. In 1844, he was appointed palæontologist to the Museum of Geology in connection with the Ordnance Geological Survey; and in 1851, on the opening of the new buildings in Jermyn Street, London, he was named professor of natural history in the School of Mines. In 1852, he was chosen president of the Geological Society, an honour never before conferred on so young a man; and in 1853, on the death of Professor Jameson, he was elected to the vacant chair of Natural History in the university of Edinburgh. In the summer of 1854, he delivered a short course of lectures—the only one he was destined to give—for at the commencement of the winter session he was seized with a severe illness, which speedily proved fatal, and terminated his life in the 39th year of his age, in the very zenith of his fame, and in the full vigour of his intellectual powers. F. had been a voluminous writer and a diligent observer of nature from his earliest youth, and had collected an immense mass of materials, many of which were, however, left at his death in a disorganised condition. He did much to advance and systematise special departments of natural history, both by his own labours and by the stimulus which he imparted to his associates and pupils; and it would be difficult to instance any naturalist who has exercised a greater influence on the thought and line of inquiry pursued by those who have cultivated the same branches of knowledge. His classification of the British *Star-fishes* opened a new era in that branch of zoology; and his discovery that air-breathing molluscs lived at the period of the Purbeck beds, has been the means of rectifying many erroneous hypotheses, and throwing unexpected light on several hitherto obscure points of geology, while the inferences which he drew from the presence of those animals have been fully corroborated. His Report on the Ægean Sea, and his observations of the tertiaries of Cos, which have proved of great value to geology, raised him to the highest rank among living naturalists. From an early period, he had directed his attention to the distribution of animal and vegetable life in different zones of the sea and land, and his observations in this path of inquiry have opened many new fields of research. F. was a diligent contributor to the current scientific literature of the day, and many of his best papers were written for the meetings of the British Association, of which he was an active member, and for the various societies with which he was connected; while he also took a most efficient share in the labours of the Ordnance Survey during his connection with its staff. His separate works, papers, and monographs, of which upwards of 200 are published, and many of which are copiously illustrated by his own beautiful drawings, cannot be individually specified; but among them we may instance the following: *On the Distrib. of Pulmonif. Mollusca in Europe* (1838); *Malacol. Monensis* (1838); *Star Fishes* (1841); *The Radiata and Mollusca of the Ægean* (1843); *Travels in Lycia* (written in conjunction with Lieutenant Spratt, 1846); *Naked-eyed Medusæ* (1847); *British Mollusca* (1853, 4 vols. 8vo, conjointly with S. Hanley); the Map of *Homoiozoic Belts* (Johnston's *Phys. Atlas*, 1854); *Collection of Literary Papers by E. Forbes* (1855); &c. See *Memoir* by G. Wilson and A. Geikie, 1861.

FORBES, Sir William, of Pitsligo, Bart., an eminent Scottish banker, son of Sir William Forbes, Bart., advocate, was born in Edinburgh, April 5, 1739. He succeeded his father when only four years old, and received his education at Aberdeen. In his 15th year, he was introduced into the bank at Edinburgh of Messrs John Coutts & Co.; and in 1761, was admitted a partner. In 1763, one of the brothers Coutts having died, while another retired on account of ill health, and two others were settled as bankers in London, a new company was formed, consisting of Sir William Forbes; Mr Hunter, afterwards Sir James Hunter Blair; Mr, afterwards Sir Robert Herries; and Messrs Stephen and Cochrane. They at first carried on business in the name of the old firm. On 1st January 1773, however, on some changes in the partnership taking place, the name was changed to that of Sir W. Forbes, J. Hunter, & Co., and of this firm Sir William continued to be the head till his death. In 1781, he purchased the estate of Pitsligo, Aberdeenshire, which had been forfeited by Lord Forbes of Pitsligo for taking part in the rebellion of 1745. Animated by genuine patriotism and public spirit, he introduced the most extensive improvements on it, and laid out and built the village of New Pitsligo. He was a member, with Johnson, Burke, Garrick, Reynolds, and others, of the celebrated Literary Club of London, and the author of a Life of his friend, Dr Beattie, the poet, published, with his works, in 2 vols. 4to, in 1805; also of *Memoirs of a Banking House*, being the history of his own, edited by Mr Robert Chambers (Edinburgh, 1860). He died at his seat near Edinburgh, November 12, 1806, aged 68. By his wife, Elizabeth, eldest daughter of Sir James Hay of Hayston, Bart., he had three sons and five daughters. Universally esteemed and respected, his character is well described by Sir Walter Scott in the introductory address of one of the cantos of *Marmion*. His bank became, in 1830, the Union Bank of Scotland.

FORBES, James David, Principal of the United College in the university of St Andrews, a grandson of Sir W. Forbes, the banker, was born at Colinton, near Edinburgh, April 20, 1809. He studied in the university of Edinburgh from 1825 until 1830, when he was admitted to the Scottish bar. On the death of Sir John Leslie (q. v.), he was appointed, in 1833, to the chair of natural philosophy in the university of Edinburgh, after a contest in which, among other competitors, he was opposed by Dr (afterwards Sir David) Brewster and Mr Galloway. In 1842, the Institute of France enrolled him among its corresponding members. He is, besides, a member of numerous other scientific societies at home and abroad, has received the Royal and the Rumford medals from the Royal Society of London, and two Keith medals from the Royal Society of Edinburgh, and is D.C.L. of Oxford. In 1860, F. resigned his chair in Edinburgh, to become Principal of the United College in the university of St Andrews. Among his contributions to science are—the polarisation of radiant heat by the tourmaline, and also by reflection (1836), and its circular polarisation—discoveries forming some of the strongest proofs of the identity of calorific and luminous rays; the unequal polarisation of heat from different sources (1844); the refrangibility of heat; the depolarisation of heat; &c. This whole series of experimental results is of a very high order of importance. He is, however, best known to the world in general by his researches on the motion of glaciers. See *Travels in the Alps* (1843); *Norway and its Glaciers* (1853); *Tour of Mont Blanc and Monte Rosa* (1855); and *Occasional Papers on the Theory of Glaciers* (1859). He was undoubtedly the first to establish the great *fact*, that glacier ice moves in its channel like a viscous fluid, the middle moving faster than the sides, and the upper portions faster than the lower. His *theory* of glacier phenomena has encountered a good deal of opposition from some quarters, and cannot yet be considered as settled. See Glaciers. In meteorology, F. has, among other things, improved Wollaston's application of the thermometer to the determination of heights, and has verified with great care Fourier's theoretical results concerning the temperature of the ground at different depths and in different kinds of soil and rock. Besides the works already named, numerous very valuable papers by F. are to be found in the *Transactions of the Royal Societies of London and*

Edinburgh, in the *Edinburgh Philosophical Journal*, and other periodicals.

FORBES, Sir John, an eminent physician, was born October 18, 1787, at Cuttlebrae, Banffshire, and died November 13, 1861. After studying at Aberdeen and Edinburgh, he entered the navy in 1807 as assistant-surgeon, and continued on active duty till 1816, when he finally left the service. In 1817, he took the degree of M.D. at Edinburgh, and soon afterwards settled as a physician at Penzance, from whence he removed in the course of a few years to Chichester. In 1840, F. went to London, where he speedily obtained a large practice. He was knighted in 1853 by the Queen, to whose household he held the appointment of Physician in Ordinary, while he was at the same time Physician Extraordinary to Prince Albert. He was a Fellow of the College of Physicians, and the Royal Society of London; D.C.L. of Oxford, and a member of numerous foreign societies. F., conjointly with Drs Tweedie and Conolly, was the editor of the *Cyclopædia of Practical Medicine*, which, in addition to the numerous contributions of the editors, included the labours of more than sixty British physicians, of the first rank. This work, which has exercised a most beneficial influence both on the theory and practice of medicine, was completed in 4 vols. 8vo, in 1835. In 1836, F. founded the *British and Foreign Medical Review*, which he carried on with great success for twelve years. The services which he thus rendered to his brother-practitioners placed him deservedly among the foremost of his profession. To F. in a great measure belongs the merit of having introduced the use of the stethoscope in England, and of having successfully directed the attention of British practitioners to the art and practice of physical diagnosis. In 1831, he published the first edition of his translation of Laënnec's *Treatise on Auscultation;* and in 1838, when the fifth edition appeared, the new method was already extensively used. F. was a ready and pleasant writer, as is amply shewn by the various records of his summer rambles; among which we may instance his *Physician's Holiday* (1849), and his *Sight-seeing in Germany and the Tyrol* (1856). His last professional work, entitled *Nature and Art in the Cure of Diseases* (1857), contains a systematic exposition of his medical opinions and doctrines.

FORBES MACKENZIE ACT. The statute, popularly known by the name of the gentleman (Mr Forbes Mackenzie, M.P. for Peeblesshire) who introduced the bill, is the 16 and 17 Vict. c. 67, entitled 'An Act for the better Regulation of Public Houses in Scotland.' This act retained in general the provisions of 9 Geo. IV. c. 58, by which the granting of certificates by justices of the peace and magistrates, authorising persons to keep common inns, ale-houses, and victualling-houses in Scotland was regulated. But it prohibited the granting of certificates for excisable liquors to be 'drunk on the premises,' unless on the express condition that no groceries or other provisions to be consumed elsewhere should be sold in the house or premises with respect to which such certificate is granted. The object of this portion of the enactment being to prevent grocers from becoming in reality the keepers of tippling-houses, those persons continued to be permitted to sell liquors by retail, provided that they were not consumed in their shops. In accordance with the principle of distinguishing between the different classes of houses in which the trade of a spirit-dealer should be carried on, three different grades of licences were introduced: those applicable, viz., 1, to inn or hotel keepers; 2, to public-house keepers; and 3, to grocers and provision-dealers. As regards the first class, it is enacted that they shall not 'keep open house, or permit or suffer any drinking in any part of the premises belonging thereto, or sell or give out therefrom any liquors before eight o'clock in the morning, or after eleven o'clock at night of any day, with the exception of refreshments to travellers, or persons requiring to lodge in the said house or premises; and further, that they shall not open their houses for the sale of any liquors, or sell or give out the same on Sunday, except for the accommodation of lodgers and *bonâ-fide* travellers.' The same restrictions are imposed on the second class of persons—viz., the keepers of public-houses, with this addition, that no exception is made in their case in favour of travellers or lodgers; whilst grocers and provision-dealers, in addition to the prohibition to open on Sundays, and that already mentioned with reference to the consumption of spirits on the premises, are forbidden 'to sell or give out any liquors before six o'clock in the morning, or after eleven o'clock at night.' Separate licences were also introduced for the sale of malt liquors from those applicable to the sale of wine and spirits, all of which had formerly been included under one licence. By this statute, also, for the first time in Scotland, the very formidable power was conferred on the police of entering at any time any public-house, or house where refreshments are sold to be consumed on the premises, and penalties were awarded against those who refused to admit them, or who obstructed their entrance. These provisions having given rise to much discussion, a Royal Commission to inquire into the working of the act was issued on the 25th April 1859. The result of the commission was the issue, as usual, of two enormous volumes of printed evidence, and of a report, more distinguished for its length than for the value of the suggestions which it contains. The commissioners arrived at the conclusion, that 'although intemperance still prevails to a lamentable extent, it would seem that this vice has been for some time gradually descending in the scale of society, and that it is now chiefly confined to the lowest class of the population.' This effect the commissioners ascribe to several causes, of which the first and most important is the increase of the duty on excisable liquors from 2*s.* 4¾*d.* per imperial gallon, at which it stood in 1823, to 8*s.*, to which it was finally raised in 1855. Nor do they deny to the Forbes Mackenzie Act its share of merit. 'The beneficial effect of the act,' they say, 'is proved by the evidence which we received as to the diminution of crime, and the change for the better in the habits of the people, immediately after the passing of the act, when its provisions were strictly enforced, and by the tendency in an opposite direction which in some places has followed its less rigorous enforcement during the last two years. In some towns, there has been, on the part of the magistrates, great remissness in administering the law. The result seems to have been, if not an increase of crime in these places, at least the absence of the improvement witnessed elsewhere.' Whilst thus generally approving of the act, the commissioners suggest a number of alterations, mostly with the view of enabling the police to carry out its provisions with greater efficiency. In reference to the difficulty experienced by hotel-keepers in ascertaining what persons came under the descriptions of *bonâ-fide* travellers, the commissioners recommend that in future 'persons inducing hotel-keepers to sell or give out excisable liquors to them on Sunday, by falsely representing themselves as travellers, should be guilty of an offence, and be liable, on conviction, to a fine.' In these circumstances, it becomes important to know that it has been decided in England that to constitute a 'traveller' within the meaning of the corresponding Act 18 and 19 Vict. c. 118, s. 2, it is a matter of indifference whether the parties be travelling for business or pleasure, and that a walk, ride, or drive, for exercise and amusement of such length as to render refreshments desirable, is a sufficient journey. In Atkinson *v.* Sellers (5 C. B. N. S. 442), Chief Justice Cockburn remarked, that 'a man could not be said to be a traveller who goes to a place merely for the purpose of taking refreshment. But if he goes to an inn for refreshment in the course of a journey, whether of business or of pleasure, he is entitled to demand refreshment, and the innkeeper is justified in supplying it.' See also Taylor *v.* Humphreys, C. P. 705; 4 L. T. N. S. 314. The first was in the case of a drive from Liverpool of 5½ miles, the second of a walk from Birmingham of 4 miles.

FORBI'DDEN FRUIT, a name fancifully given to the fruit of different species of *Citrus*. In the shops of Britain, it is a small variety of the Shaddock (q. v.) which generally receives this name. But on the continent of Europe, a different fruit, regarded by some as a variety of the orange, and by some as a distinct species (*Citrus Paradisi*), is known as the Forbidden Fruit, or Adam's Apple. Like some other fruits of the same genus, it was recently introduced into the south of Europe from China. The tree has broad, tapering, and pointed leaves, the leaf-stalks winged; the fruit is large, somewhat pear-shaped, greenish-yellow, of very uneven surface, having around its base a circle of deeper depressions, not unlike the marks of teeth, to which it probably owes its name. It is chiefly the rind which is the edible part; the rind is very thick, tender, melting, and pleasant; there is very little pulp; the pulp is acid.

The name Forbidden Fruit has also been given to the fruit of *Tabernæmontana dichotoma*, a tree of Ceylon, of the natural order *Apocynaceæ*. The shape of the fruit—which is a follicle, containing pulp—suggests the idea of a piece having been bitten off, and the legend runs that it was good before Eve ate of it, although it has been poisonous ever since.

FORCE; E'NERGY. Till we know what Matter (q. v.) is, *if there be* matter, in the ordinary sense of the word, at all, we cannot hope to have any idea of the absolute nature of force. Any speculations on the subject could only lead us into a train of hypotheses entirely metaphysical, since utterly beyond the present powers of experimental science. If we content ourselves with a definition of force based on experience, such a definition will say nothing of its nature, but will confine itself to the effects which are said to be due to force, and in the present state of our knowledge it is almost preposterous to aim at more.

Our first ideas of force are evidently derived from the exertion required to roll, or lift, bend, or compress, &c., some mass of matter; and it is easy to see that in all such cases where muscular contraction is employed, matter is moved, or tends to move. Force, then, we may say generally, is *any cause which produces, or tends to produce, a change in a body's state of rest or motion.* See Motion, Laws of. The amount or magnitude of a force may be measured in one of two ways: 1. By the pressure it can produce, or the weight it can support; 2. By the amount of motion it can produce in a given time. These are called respectively the Statical and Dynamical measures of force. The latter is, as it stands, somewhat ambiguous. What shall we take as the quantity of motion produced? Does it depend merely on the velocity produced? or does it take account of the amount of matter to which that velocity is given? Again, is it proportional to the velocity itself, or to its square? This last question was very fiercely discussed between Leibnitz, Huyghens, Euler, Maclaurin, the Bernouillis, &c.; Leibnitz being, as usual with him in physical questions, on the wrong side. Newton, to whom we owe the third law of motion, had long before given the true measure of a force in terms of the motion produced. This law is an experimental result—that when pressure produces motion, the *momentum* produced (see Momentum) is proportional to the pressure, and can be made (numerically) equal to it by employing proper units. Hence momentum is the true dynamical measure of force, which, therefore, is proportional to the *first* power only of the velocity produced. What is properly measured in terms of the *square* of the velocity, we shall presently see. For various properties of force, statical and dynamical, see the following articles: Composition of Forces, Couples, Centre of Gravity, Central Forces, Falling Bodies, Mechanical Powers, Virtual Velocities.

It is obvious that in order to produce any effect at all, or to do work, as it is technically called, a force must produce *motion*, i. e., must move its point of application. A weight laid on a table produces no effect whatever unless the table yields to the pressure, i. e., unless the weight descends, be it ever so little. We do no work, however much we may fatigue ourselves, if we try to lift a ton from the floor; if it be a hundredweight only, we may lift it a few feet, and then we shall have done work—and it is evident that the latter may be measured as so many pounds raised so many feet—introducing a new unit, the Foot-pound, which is of great importance, as we shall shortly see, in modern physics. See Work. This is evidently, however, a statical measure of work, since no account is taken of velocity. Have we then for work, as we had for force, a *dynamical* measure? Let us take a simple case, where the mathematical investigation is comparatively very easy, and we shall find we have. We know (see Velocity; Motion, Laws of) that if a particle be moving along a line (straight or not), and the distance moved (in the time t) along the line from the point where its motion commenced be called s, its velocity is $v = \frac{ds}{dt}$. Also we know that the force acting on it (in the direction of its motion) is to be measured by the increase of momentum in a given time—this gives (just as the last equation was obtained) $F = m\frac{dv}{dt}$. From these two equations, we have, immediately, $mvdv = Fds$, or, as the rudiments of the differential calculus give at once, $\frac{mv^2}{2} = \int F ds = F.s$ if the force be uniform.

The quantity on the right-hand side is the sum of the products of each value of F, by the corresponding space ds, through which the particle moved under its action. It is therefore the whole work done by the force. On the left hand, we find half the product of the mass, and the square of the velocity it has acquired; in other words, the Vis-viva (q. v.). Hence, in this case, the vis-viva acquired *equals* the amount of work expended by the force.

It appears from a general demonstration (founded on the experimental laws of motion, and therefore true, if they are), but which is not suited to the present work, that if, in any system of bodies, each be made up of particles or atoms, and if the forces these mutually exert be in the line joining each two, and depend merely on the distance between them, then we can express the required proposition in the following form:

Any change of vis-viva in the system corresponds to an equal amount of work gained or lost by the attractions of the particles on each other.

What is spent, then, in work, is stored up in vis-viva; and conversely, the system, by losing some of its vis-viva, will recover so much work-producing power. If we call the former, as is now generally done, *Actual*, and the latter *Potential*, *Energy*, we may express the above by saying, that in any system of bodies where the before-mentioned restrictions are complied with, *the sum of the actual and potential energies cannot be altered by the mutual action of the bodies.* The most simple and evident illustrations of this proposition are to be found in the case of the force known as gravitation. The potential energy of a mass on the earth's surface is zero, because, not being able to descend, it has, in common language, no work-producing power. If it be raised above the surface, and then dropped, it is easy to see that the work expended in raising it will be exactly recovered as vis-viva after its fall. For (see FALLING BODIES) a mass falling through a space, h, to the earth acquires a velocity v, such that $v^2 = 2gh$, or if m be the mass, $\frac{mv^2}{2} = mg.h.$ The left-hand side gives the vis-viva acquired by the fall—the right is the product of the weight (mg) and the height fallen through—or is the work required to elevate the mass to its original altitude.

Hence we may calculate the amount of work which can be obtained from a *head* of water in driving water-wheels, &c., remembering, however, that there is always a *loss* (as it is usually called) due to friction, &c., in the machinery. That there is a loss in useful power, is true, but we shall find presently that in energy there is none, as indeed our general result has already shewn. *Where* the apparently lost energy goes, is another question.

Another good example of potential energy is that of the weights in an ordinary clock. It is the gradual conversion of potential into actual energy in the driving weight which maintains the motion of the clock, in spite of friction, resistance of the air, &c.; and we have in the actual energy of sound (which is *motion*) a considerable portion of the expended potential energy of the striking weight. A coiled watch-spring, a drawn bow, the charged receiver of an air-gun, are good examples of stores of potential energy, which can be directly used for mechanical purposes.

The chemical arrangement of the different components of gunpowder, or gun-cotton, is such as corresponds to enormous potential energy, which a single spark converts into the equivalent active amount. But here, *heat* has a considerable share in the effects produced; it may then be as well, before proceeding further, to consider how we can take account of it, and other physical forces, as forms of energy.

Correlation of Physical Forces.—So far as we yet know, the physical forces may be thus classified: I. GRAVITATION (q. v.); II. MOLECULAR FORCES—COHESION (including CAPILLARITY), ELASTICITY, CHEMICAL AFFINITY; III. HEAT AND LIGHT; IV. ELECTRICITY (including MAGNETISM); V. ANIMAL FORCE; VI. VITAL FORCE, having, as some most irrationally suppose, an analogue in inorganic masses, which may be called Crystalline Force. (This idea is examined further on.) Of these, I., II., and some forms of III., are more immediately connected with *matter* than the others—that is to say, that the remainder almost necessitate the hypothesis of the existence of some medium unlike ordinary matter, or, in popular language, an *imponderable.* The almost universal opinion of physicists, however, seems to be, that even the former must be accounted for in some such way. Newton, in his second letter to Bentley, says, with respect to gravitation (and it is obvious that similar language is applicable to molecular forces generally): 'You sometimes speak of gravity as essential and inherent to matter. Pray, do not ascribe that notion to me, for the cause of gravity is what I do not pretend to know.' And again in the third letter: 'It is inconceivable that inanimate brute matter should, without the mediation of something else, which is not material, operate on, and affect other matter without mutual contact, as it must do, if gravitation, in the sense of Epicurus, be essential and inherent in it; and this is one reason why I desired you would not ascribe innate gravity to me. That gravity should be innate, inherent, and essential to matter, so that one body may act upon another at a distance through a *vacuum*, without the mediation of anything else, by, and through which their action and force may be conveyed from one to another, is to me so great an absurdity, that I believe no man who has in philosophical matters a competent faculty of thinking, can ever fall into it. Gravity must be caused by an agent acting constantly according to certain laws; but whether this agent be material or immaterial, I have left to the consideration of my readers.' Of what that medium may consist, we cannot, of course, hazard even a conjecture; but if it be composed of separate atoms—i. e., not continuous—it is evident that a second medium will be required to help the particles of the first to act on each other (for without this, the first medium would be merely obstructive), and so on. This must stop somewhere; why not, then, at the first? But in the present state of our knowledge of mechanics, a continuous medium is barely conceivable, and its motions, &c., present considerable difficulties to even plausible mathematical treatment. If we take the view opposed to Newton's, as Mosotti and others have done (their ideas are considered further on), we can, in a very artificial manner, however, account for gravitation and molecular action; but, as before said, the foundations of this attempt at explanation are hardly tenable.

Just as sound depends on the elasticity of the air and vibrations thereby maintained and propagated, light and radiant heat, which are certainly identical, most probably consist in the vibrations of some very elastic fluid. This has been provisionally named Ether (q. v.). If it be continuous, it may help us to account for the first two categories of force also, as we have already seen; if not so, as is more likely, fresh difficulties arise. Light and heat, however, are undoubtedly forms of motion, and correspond, therefore, to so much vis-viva or actual energy. Even heat in a liquid or solid body must correspond to some vis-viva in the material particles, since a hot body can give out both light and heat, and a body may be heated by luminous or calorific rays which are vibratory, as we have seen.

Class IV. contains perhaps the most puzzling of all these forces. That there is something in common in all the forms of electricity, and that magnetism is nearly related to them, is certain; it is probable, also, that frictional electricity, when statical, consists in something analogous to a coiled spring, or is a form of potential energy—the others being forms of actual energy. Some have supposed magnetism to be also a form of potential energy, but Ampère's discoveries have materially lessened the probability of the truth of this hypothesis. We shall consider this again.

Class V. may be deferred for the present.

As to Class VI., it seems, from the observations of physiologists as to the formation of cellular matter, and the production in living organisms of compounds which have not yet been made by ordinary chemical processes, that the vital force, if there be such, is not a force which does work, in the mechanical sense of the term, but merely *directs*, as it were, the other natural forces *how to apply* their energies. Were a railway train running on a smooth horizontal line of rails, it would retain for ever its original velocity; but in turning a curve, it would be acted on by deflecting forces, without which its path would be straight. These forces *do no work*, as is evident, since this would be shewn in alteration of the vis-viva, and none takes place. They modify, however, the direction in which the train moves.

When gangs of labourers and masons are at work building an edifice, the former are employed raising stones, mortar, &c., the latter in laying them; but there is present an overseer with a plan, who, doing no (mechanical) work himself, guides and directs the proper expenditure of force by the working body. In this view of the case, the labourers are the physical forces, and the overseer the vital force. It is quite certain that the so-called crystalline force cannot properly be put in this category, as presenting even an analogy, however slight; it is probably an effect, not a cause, and due to the different forms of simple or compound particles of matter, and the consequent variations in their molecular forces in different directions.

So far, then, for the possible nature of the forces, which, with the probable exception of VI., can be considered as various forms of energy. Can they be transformed one into another, as the different kinds of mechanical energy can? Take the potential energy of gravitation to begin with. We can employ it to drive a water-wheel. This turns a shaft, to which, if a tight break be applied, heat will be produced by friction, and light also, if a rough wheel on the shaft be made to rotate against a piece of flint or pyrites; or electricity may be produced by employing the moving power to turn an ordinary electrical machine, or a magneto-electric one; and from the electricity so produced, electrical attractions and currents may be derived; from them heat and light again. Or the currents may be employed to magnetise a needle or a piece of soft iron, or to produce chemical decomposition.

Again, heat may be employed by means of a steam-engine as a substitute for the water-power or potential energy of gravitation, and the above effects be produced. It may also be employed in raising weights, and therefore in producing the potential energy in question; or it may be employed to produce Thermo-electric Currents, and thence all the ordinary effects of electricity, including the motion of a magnetic needle.

Light may be employed to produce chemical combination or decomposition, as we see in photography; it may also by the same means be made to produce electric currents, and consequent *motion* of a needle. It is not yet proved that light can produce magnetism *directly*, though there can be little doubt that, if properly applied, it is capable of doing so.

Chemical action in a voltaic battery can be made to produce motion, heat, light, electricity, electrical attractions and magnetism, and to overcome other chemical affinity.

Capillary action has been employed to produce electricity, and mechanical effects, &c., but we need not go through the whole category.

In these experimental results, then, consists what is called the Correlation of the Physical Forces—i. e., the transmutability of one of the latter into another or others. The idea is old, but the proofs of its truth have only become numerous within the last half-century. Grove has published an excellent treatise with the above title; to this we refer the curious reader for further detail on this interesting subject.

Conservation of Energy.—But a far more important principle, being, in fact, the *precise* statement of the preceding—which is somewhat vague—is that of the Conservation of Force, or rather Energy. It is simply the extension (to all the physical forces) of the principle which we have given in full, and proved in a particular case, at the beginning of this article—i. e., that the sum of the potential and actual energies of any set of moving bodies cannot be altered by their mutual action. Let us now suppose heat, light, &c., to consist in vibratory movements of particles, and in their relative states of distortion, &c., and make the supposition that these particles act on each other—no matter by what means—in the line joining each two, and with forces which depend on their distance, and we have at once the theorem, that the sum of the potential and actual energies is a quantity unalterable in any system, save by external influences. Hence, when mechanical power is said to be lost, as it is by the unavoidable friction in machinery, &c., it is really only changed to a new form of energy—in general, heat. Thus, when a savage lights his fire, he expends animal force in rubbing two pieces of dry wood together. If these pieces of wood were not in contact, no force would be required to move them past each other—more and more is required as they are more strongly pressed together. The equivalent of this force so expended is found in the heat produced. Davy shewed that two pieces of ice might be melted by rubbing them together. A skilful smith can heat a mass of iron to redness by mere hammering. Here the actual energy employed is partly given out in the shape of heat, and partly stored up in the iron as potential energy due to the compression of the mass, or the forcible approximation of its particles. Amongst the earliest, and certainly the *best* experiments on this subject, are those of Joule (q. v.). He determined the relation between the units of heat and potential energy of gravitation, by various methods, which gave very nearly coincident results. One of these we may mention. A paddle-wheel is so fixed as to revolve in a closed vessel full of water. The wheel is driven by the descent of a known weight through a measured space, and precautions are taken against losses of energy of all kinds. The water agitated by the paddle-wheel comes soon to rest, as we know; but this is due to friction between its particles; and the final result is the heating of the water. The quantity of water, and also the number of degrees by which its temperature is raised, being measured, a simple proportion enables us to find how many foot-pounds (see FOOT-POUND) of mechanical energy correspond to the raising by one degree the temperature of a pound of water. The result is, that the heating a pound of water one degree Fahrenheit, is effected by 772 foot-pounds—and this number is called Joule's Equivalent. In other words, if a pound of water fall to the ground through 772 feet, and be then suddenly arrested, its temperature will be raised one degree; and, conversely, the heat that would raise the temperature of a pound of water one degree, would, if applied by a steam-engine or otherwise, raise 772 pounds one foot high. Now (see HEAT OF COMBINATION), we know the amount of heat which is produced by the burning (in air) of any material whose composition is known.

It follows, then, that from the mere quantity and composition of a substance, we can tell the amount of mechanical work due to its combustion; that is, supposing it all to be effective. As we have been led to the mention of heat of combustion, let us consider what this is due to. Combustion (in air) is merely a chemical combination of the constituents of the burning body with oxygen—the heat and light which are developed are therefore, by the conservation of energy, equivalent to the excess of potential energy of the uncombined, over the combined, oxygen and combustible.

That this is the real state of the case—and that the original setting fire to the combustible has nothing to do with the matter, as is frequently imagined—will be made evident by considering any spontaneous combination, say that of chlorine and copper filings, or of mercury and sodium, &c., in which cases the potential energy lost by the compound appears as heat, light, and sometimes sound.

The equivalents of the other physical forces have not been even approximated to, with the exception of that of light. Thomson has determined the energy of a cubic mile of sunlight at the earth to be somewhere about 12,000 *foot-pounds*, giving about 10,000 as the *Horse-power* (q. v.) of each square foot of the sun's surface. There are some additional difficulties in the way when we seek the equivalent of electricity, for here the question arises: 'Is there a special substance which is, or whose motions are, electricity, or is it merely another mode of motion of the luminiferous ether?' for we can scarcely suppose it to be due to motions of the particles of *matter*. If the first, we have as yet no means of estimating its energy; if the latter, we may consider it as within the reach of experiment. It may merely be remarked here, that Weber's exquisite theoretical statement of dynamical electricity—resting on the fundamental assumption that there are two *electric fluids*—requires the admission of mutual forces, which vary with the relative velocity of its particles, and for which, therefore, the conservation of energy does *not* hold.

Helmholtz, in an admirable paper (*Ueber die Erhaltung der Kraft*, translated in Taylor's *Scientific Memoirs*, New Series, i.), starting from the assumptions above explained, has applied the principle of conservation of force to the investigation of many recondite problems connected with most of the physical forces. We cannot, of course, enter into his work in detail, as it is somewhat analytical, but we may freely borrow such of its contents as we have not already alluded to, at least such as will suit the plan of this article.

A very good example of the conservation of energy is found in the increasing velocity of a planet or comet as it approaches the sun, and thus loses potential energy; and also in the fact, that in the case of these bodies the mere distance from the sun, and the velocity at that distance, enable us to tell at once the nature of the orbit described—i. e., which of the conic sections it is.

Latent heat is a form of potential energy, depending on the physical state of the substance in which it is stored up. The same may be said of those substances which, when mixed, produce heat or cold, as water and sulphuric acid, or nitrate of ammonia. It is easily seen that here the heat or cold depends upon a change of molecular arrangement of some kind; that is, a change of the potential energy.

In magnetism and statical electricity, of course, the conservation of energy holds, as we know that all the phenomena can be explained by attractions and repulsions, following the law of gravitation. In the discharge of a Leyden battery, the potential energy lost is reproduced as heat in the connecting wires, and as light, heat, and sound with the disruptive spark. In charging a Leyden jar by means of the electrophorus, the charge is directly produced by the expenditure of mechanical force in overcoming the attraction of the negative electricity of the resinous plate for the positive electricity of the cover.

In the ordinary voltaic battery, the excess of loss of potential energy in the cells, by the chemical union, say of zinc and oxygen, and of sulphuric acid and oxide of zinc, over that gained by the decomposition of water, produces the actual energy of the current, which may be transformed into heat, light, magnetism, or motion, or two or more. Or it may be employed to reproduce potential energy by chemical decomposition, say that of water. This again, by a spark, can be reconverted into actual energy as an explosion accompanied by heat, light, and sound. When an electric current causes the motion of a magnetised needle, our general principle should lead us to infer that the current itself will be weakened. This is found to be the case, but, as it should be, *only during the motion* of the needle. The needle in a permanent state of deflection produces no effect whatever. Now, the diminution of an electric current is simply equivalent to the addition of a weaker current passing in the opposite direction. We should expect, then, that the motion of a magnet near a conducting wire will in general produce a current in the latter, and this is, in fact, Faraday's great discovery of magneto-electric induction. In this case, the current ceases so soon as the magnet ceases to move relatively to the wire.

If a mass of copper or other good conductor be set in rapid rotation near a powerful magnet, the motion produces electric currents in the copper, which, being attracted by the magnet, soon bring the mass to rest. It is not so clear in this case into *what* the mechanical energy of the rotation has been transformed, especially as the electric currents cease with the motion; but if we keep up the rotation forcibly, we find in a short time the copper growing warm; in other words, the motion has been transformed into electricity, and the latter into heat. This very beautiful experiment is due to Joule, and has been repeated in a striking popular form by Foucault.

Advantage has been taken by Faraday of the phenomena of induction, to produce electric currents by aid of the earth's magnetism. His apparatus is simply a revolving disc of metal, and the terminal wires touch, one its axis, the other its edge. The force which is here transformed into electricity is the additional effort requisite to turn a *conducting* disc, instead of an equal *non-conducting* one. It is a curious consequence that in all metallic machinery a portion of the energy of the prime mover is lost in producing electricity, and finally heat, in the moving parts, so that heat in such cases is not entirely, though very nearly, due to friction alone.

Perhaps one of the most singular of these transformations of energy is that already referred to of heat into electricity. Certain crystals, such as tourmaline, become electrified by heat; but electric *currents* can be produced by simply heating a *junction* of two wires or bars of different metals, the other ends also being in contact. Now, if we were to heat the other junction, it is obvious that as at it the metals are arranged in the opposite order, we should produce a contrary current; conversely, by cooling them we should strengthen the first. But the conservation of force requires that such a junction should be heated or cooled according to the direction in which a current passes through it. This was discovered by Peltier.

Animal force, again—or rather its actual energy—is simply a transformation of the potential energy of food. This is well illustrated by the increased diet which is required when man or beast abruptly changes from a state of inactivity to one of toil, as with a polar bear after his winter's sleep; or by the greater amount and better quality of food which are necessary for criminals subject to hard labour, than for those who are merely imprisoned.

Since, then, as far as we have yet seen, there is no such thing as gain or loss of energy anywhere, while it appears that the ultimate transformation of such energy is heat, and that the latter tends to a uniform diffusion or dissipation, in which it is unavailable, as far as we know, for further transformation (see HEAT), whence do we procure the supplies of energy which are requisite to maintain the economy of life? We answer: Chiefly, or indeed entirely, from the sun, whence they come as light and radiant heat, perhaps in other forms. Without the sun, where would be vegetation?—without the latter, where animal life? Where would be our stores of fuel, whether wood or coal? It is entirely, then, we may say, to the directly supplied energy of the sun that we look for the maintenance of life; and this leads to a question not of much importance to ourselves, to be sure, but of vast future consequence to the human race: Is this supply finite? Will the sun in time have given off all its energy, or is it continually receiving accessions itself, and if so, has it an inexhaustible store to draw from?

Now, whether the sun be a hot mass, or be surrounded by an atmosphere in an intense state of combustion, or whether it derives the main part of its heat, as Thomson supposes, from gravitation (in a way presently to be considered), it is certain that, as far as we know, it must at some period be exhausted. Such is the apparently inevitable verdict of the conservation of energy.

The gravitation theory of the origin of energy generally may be given in some such form as this: The matter in the universe, in a state of coarser or finer division, originally filled all space, and possessed, therefore, by virtue of gravitation, a certain amount of potential energy. As particles gradually moved up to each other, and became slowly agglomerated into masses, more and more of this energy was realised in its actual form; some as heat (that of the sun, or the internal heat of the earth, &c.), some as vis-viva of axial or orbital rotation, &c. There still remains unagglomerated in space (see ZODIACAL LIGHT, AEROLITES, NEBULÆ) much of this original matter still falling mainly towards the larger masses, as the sun and stars, and exchanging its potential for actual energy. But the latter, as we have seen, tends ultimately to become heat, and to seek a uniform diffusion. This, then, it appears, is to be the last scene of the great mystery of the universe—chaos and darkness as 'in the beginning.'

An immediate consequence of the truth of the conservation of energy is the impossibility of what is usually understood by Perpetual Motion (q. v.); for it is to be carefully remembered that perpetual motion, in the literal sense of the words, is not only possible, but very general. If there were no such thing as friction, or if we had a perfectly smooth body, in the form of a teetotum, for example, it would spin for ever in vacuo with undiminished speed. The earth in its axial rotation affords a good example. Were it a perfect sphere, and of uniform material, the other masses of the system could produce no effect whatever on its rotation, and the latter would, as indeed it does, as far as we can determine, remain for ever unchanged. And even, as we have already seen, when one motion, as electricity, or ordinary vis-viva, is lost, we find it reappearing in other forms of motion, such as heat and light. But this is not the technical acceptation of the term, perpetual motion; it is popularly understood to mean a source of motion which will not only preserve its own vis-viva unchanged, but also *do work*. This is, of course, incompatible with the conservation of energy, for wherever work is done, equivalent energy in some form or other is consumed. As we have not, however, an absolute *certainty* of, though very powerful evidence indeed for, the truth of the principle, it would be unphilosophical to conclude that perpetual motion is absolutely impossible. It is certain, however, that it cannot be attained by any mechanical arrangement; and neither heat, light, nor magnetism can give us any assistance. If we knew more than we do at present about electricity, we should probably add it also to the category. The ordinary attempts which are still being made in thousands by visionaries, are simply absurd, based as they are for the most part on ignorant applications of mechanics. There is absolute impossibility here; and a 'perpetual motionist' of the common herd is far more infatuated than a 'squarer of the circle;' for the latter's problem *may* be solved, though certainly not by the means usually employed, or in the form usually sought for.

We may now briefly consider the theories of the physical forces which have been advanced of late times, and we may take such as are worth notice together. All of them assume at the outset forces of attraction or repulsion between particles, or else a highly elastic fluid, or rather solid, if we may so call it, in which the particles of matter float, or are imbedded. We have already considered the difficulties attending the latter supposition; but it is the only one which does not refer force back to force, thus apparently leaving the question where it found it. We may dismiss it with the remark, that a fluid or quasi-solid absolutely continuous and alike in every part is difficult to conceive; and it is hard to understand how motion can be propagated through it. If it be not continuous, forces must be supposed to be exerted by its parts on each other, else the motion of one part would not affect the others. There is one way in which the latter difficulty has been attacked, which seems plausible enough; and that is, that the particles of this fluid are in a state of rapid motion, and continually impinging on each other and on the particles of matter, no forces being exerted except those of pressure at the impact. But, unless these particles be supposed *elastic*, and what is elasticity but a form of molecular force (*force again*), their motion would be lessened at every impact, and destroyed completely if the impact were direct. This objection seems to be a very strong one. The first-mentioned theory, that of Epinus and Mosotti, assumes that material particles float in a general atmosphere of ether, that the particles of each repel one another, but that a particle of matter attracts one of ether. From these suppositions, and an hypothetical law connecting pressure with density in such an ether, Mosotti has deduced gravitation and the molecular forces; but to apply the hypothesis to the other physical forces, other suppositions are necessary. These have been supplied by Clausius and Redtenbacher, who, with the assumptions of particles of matter and of ether as before, imagine those of matter to attract each other, and also those of ether, but the latter to be mutually repulsive. Light and radiant heat, according to this theory, are vibrations of the ether which fills all space between the particles of matter, or rather, between the atmospheres of ether which, by the foregoing assumptions, the particles of matter will collect about them. Heat consists of vibrations of the molecules of matter, or of the groups of atoms (see ATOMIC THEORY) of which the molecule of a compound body is built up, together with their atmospheres. Electricity, magnetism, &c., are explained to be rotations in the atmospheres. Redtenbacher and Clausius are not quite agreed as to the physical forces corresponding to each of these forms of motion, but the above sketch will give a general idea of the nature of their speculations.

But the most startling of all the reflections on force, and its ultimate nature, which have perhaps ever been made, are those of Faraday. Without calling in question in ordinary cases the truth of the conservation of energy, he has endeavoured, by experiment (the only genuine test in a question so novel and so profound), to prove what may be called the Conservation of Force, if we understand *force itself*, and *not energy*. He argues thus: two masses, according to the undisputed law of gravitation, attract with four times their mutual force if their distance be diminished to half; and with only one-fourth of the same, if their distance be doubled. He asks *whence* comes the additional force in the former, and *what becomes of* the lost force in the latter case?

Now, it is evident that this is a new question, totally distinct from any we have yet considered. To answer it, we must know *what* force is. Would gravitation have any existence if there were but one particle of matter in the universe, or does it suddenly come into existence when a second particle appears? Is it an attribute of matter, or is it due to something between the particles of matter? Faraday has tried several experiments of an exceedingly delicate kind, in order to get at some answer to his question. A slight sketch of one of them must suffice. A pound-weight is not so heavy at the ceiling of a room as it is when on the floor; for, in the former case, it is more distant from the mass of the earth than in the latter. The difference for a height of 30 feet is (roughly) about $\frac{1}{350,000}$th of a pound. Now, if a mass of metal be dropped through such a space, an additional force, $\frac{1}{350,000}$th of its weight, is called into play, and the object of the experiment was to detect whether electrical effects accompanied this apparent *creation* of force. The mass, therefore, was a long copper wire, whose coils were insulated (see ELECTRICITY) from each other, and whose extremities were connected with those of the coil of a delicate Galvanometer (q. v.). Had any trace of an electric current been produced, the needle of the galvanometer would have been deflected, but, when all disturbing causes were avoided, no such deflection was detected. Other experiments with a view to the detection of other physical forces, were also tried, but, like the first, with negative results only. We must not, however, conclude that such can never be found, as this would be assuming the absolute truth, in all cases, of the conservation of energy, which is no doubt thoroughly borne out by experiment in many cases, but not even approximately in others; while even in the former class more delicate instrumental means *may* enable us to trace small but most important deviations from absolute exactness; and it is to the results of such trials that we must look for further information as to the *nature* of force, and the generality of the law of conservation of energy.

There are, in mechanics, several other quantities which retain a fixed value under certain circumstances. We may briefly consider a few of them.

Conservation of Areas. Invariable Plane.—We have seen (CENTRAL FORCES) that if a particle move about a centre of force, its motion is confined to a plane, and its radius vector traces out equal areas in equal times. Similar theorems hold in any system of particles acted on only by their mutual attractions. If in such a system we suppose the positions of the respective particles to be continually projected (orthogonally, see PROJECTION) on *any* fixed plane, and radii vectores to be drawn from *any* point in that plane to the projections—*the sum of the areas swept out by all those radii vectores will be equal in equal times.* Also, this being true of all planes, there is one for which this sum is a maximum, and *this plane is fixed in space.* It is thence called the invariable plane of the system. Similar propositions hold for a system of bodies each of finite size, their several axial rotations being taken into account; hence what is called the Invariable Plane (q. v.) of the Solar System.

Conservation of Momentum.—When two masses attract or impinge, the forces they exert on each other are evidently equal and opposite. Now, the measure of a force is the momentum it produces; hence equal and opposite momenta, in addition to their original quantities, will be communicated to the masses, and therefore the sum of the momenta of the two, resolved in any direction, will be unaltered; hence, *the sum of the momenta of any number of bodies will be unaltered by mutual actions either of the nature of attraction or impact.*

Conservation of the Motion of the Centre of Gravity.—Again, in such a system, the momentum of the centre of gravity of the whole in any assigned direction is the sum of the momenta of the separate bodies in that direction; hence, *the centre of gravity of a system, subject to none but the mutual actions of its components, either remains at rest, or moves uniformly in a straight line.*

FORCE AND FEAR. As consent is of the essence, or rather is the essence of all contracts, and as consent implies not only intelligence, but unfettered power of action in the consenting parties, contracts, by the laws of all civilised nations, will be invalidated if it shall be proved that they were entered into under the influence of force or fear. Circumstances which constrain the will have the same effect as those which blind the understanding, and the law of force and fear is consequently closely analogous to that of Fraud (q. v.), including under that head misrepresentation, concealment, and consequent Error (q. v.). But it is not every degree of constraint, however exercised, which will have this effect in law. On the contrary, it must be of such a description as may be reasonably supposed to influence the will of the party in the circumstances in which he is placed at the time. In determining, therefore, whether there really has been force or fear in the legal sense, the law will take into account the age, sex, education, and other personal characteristics of the party, along with the accidental circumstances in which he was placed, e. g., the state of his health and spirits at the time, whether he was alone, what anxiety he may have felt for the life or interest of others, and the like. But 'where there is no peculiar weakness of age or sex, or condition,' says Mr Bell, stating in this respect not the law of Scotland alone, but of most other countries, 'law will require, in order to annul a contract, such fear and compulsion as may reasonably shake a mind of ordinary constancy and resolution, and will not listen to the pretence of every vain and foolish fear.'—*Com.* i. p. 22, Shaw's ed. As a contract which is invalid on the ground of force and fear is not only incapable of being enforced after its invalidity has been ascertained by legal process, but from the absence of consent was invalid *ab initio*—i. e., no contract, in a legal sense, at all—the object of the law is to restore the parties to the position in which they were before it was entered into. All moneys which have been paid under the provisions of the extorted contract must consequently be repaid, and reparation in as far as possible must be made by the payment of damages for such personal injuries as the party who was dragged into it may have suffered from the enforcement of its provisions. See Reduction. By the law of England, Duress (q. v.) which will invalidate a contract must amount to fear of the loss of life or limb (Mayhem, q. v.). 'Whatever is done by a man to save either life or member,' says Blackstone, 'is looked upon as done upon the highest necessity and compulsion. Therefore, if a man, through fear of death or mayhem, is prevailed upon to execute a deed, or do any other legal act, these, though accompanied with all other the requisite solemnities, may be afterwards avoided.' But 'a fear of battery or being beaten, though never so well grounded, is no duress; neither is the fear of having one's house burned, or one's goods taken away and destroyed, because in these cases, should the threat be performed, a man may have satisfaction by recovering equivalent damages.'—Stephen's *Com.* i. p. 142. The avoidance of such a contract is, however, dependent on the will of the injured party. 'A contract made under duress may be avoided by the person whose free-will was thus restrained, though he has also an election, if he thinks proper, to insist upon it as a binding transaction' (*Ib.* vol. ii. p. 62). But the parties who are entitled to treat a contract either as a nullity or a subsisting contract, must make their election, and cannot, after treating the contract as rescinded, set it up as a subsisting contract (Addison on *Contracts*, pp. 273, 436, and 1074).

FORCELLI'NI, Egidio, an Italian philologist of great attainments, was born on the 26th of August 1688, in a village near Padua. Owing to the limited means of his family, F. was deprived of the benefit of early instruction, and was already verging towards manhood when enabled to commence a regular course of study in the seminary at Padua. His zealous industry, combined with unusual powers of learning, singled him out from his companions, and won the admiration of the learned principal, Giacomo Facciolati, who even associated him with some of his own scientific labours. The pupil rendered his teacher valuable service in the compilation of a highly important lexicon, a work which probably inspired both with the project on which F.'s literary repute is based—viz., the compilation of a vast and comprehensive vocabulary of the Latin language. The work was published after F.'s death, and pronounced by public voice as one of the most valuable acquisitions to philological science of the age. In addition to the Italian and Greek signification of the Latin word, the literal and figurative application of each expression is given in a collection of examples, in themselves a perfect compendium of knowledge, embracing the customs, laws, arts, sciences, religion, and history of the Romans. This immense work was published in 4 vols., folio, under the title, *Totius Latinitatis Lexicon, consilio et cura Jac. Facciolati, opera et studio Aeg. Forcellini Lucubratum* (Padua, 1771). Furlanetto's appendix appeared in 1816 (Padua), and a new edition of the complete work was published in 1828 (Padua). F. died in 1768.

FORCENÉ, said, in Heraldry, of a horse when rearing, or standing on his hinder legs.

FO'RCEPS (Lat. a pair of tongs or pincers), the name given by surgeons to an instrument of great antiquity, used as a substitute for the fingers, and consisting of two levers of metal jointed together crosswise, nearer to one end than the other. The hand grasping the longer ends of the levers or handles, closes the shorter ends, which are shaped so as to seize firmly the intended object. There is scarcely a surgical operation in which it is not applied; and it is made of various forms, to suit different cases. In addition to the forms used in Dentistry (q. v.), there is, e. g., the *dissecting* forceps, which has roughened points, to lay hold of small portions of tissue which are to be divided by the knife; the *lithotomy* forceps, again, has blades concave like spoons; and *fenestrated* forceps have apertures in the blades, and as the soft tissues project into these, a firm hold is obtained with less risk of tearing the parts. By means of Liston's *cutting* forceps, a powerful hand can divide a great thickness of bone. But the most important of all is the *midwifery* forceps, an invaluable invention, in cases of difficult delivery, which daily rescues from suffering and danger numerous mothers and infants. It was gradually brought to its present perfection; but the name of Chamberlen, an accoucheur of the time of James II., is associated with it, as one of its chief improvers. It consists of two concave fenestrated blades, forming a cavity into which the head of the child fits. The blades are applied separately, one to each side of the head, and then locked together. Holding by the handles, the accoucheur aids the natural efforts of labour. The instrument does not necessarily or generally injure either mother or child.

FORCING, in Gardening, is the artificial application of heat to accelerate vegetation. The term is not usually applied to the cultivation of exotic plants in hothouses, where the object is to imitate as much as possible their native climate; but it is strictly applicable to the system usually pursued with vines and pine-apples, to secure the production of fruit at desired seasons, and by different plants of the same kind in succession through a considerable period, the heat being increased for one set of plants sooner than for another. Many of the fruits and vegetables which grow well in the open air, are very commonly *forced*, in order that they may be procured at seasons when they could not without artificial means. Thus, sea-kale and rhubarb are forced by means of the heat produced by heaps of fermenting litter, by which at the same time they are blanched, and to this we owe their appearance in the market very early in the season. Potatoes, pease, kidney-beans, asparagus, salads, &c., are often forced by means of hotbeds, or in flued pits; or a place is found for them in hothouses. Strawberries are cultivated in pots, and forced in hothouses; and some kinds of fruit-trees are often treated in the same way, particularly cherries; and very diminutive trees may be seen richly loaded with fruit. Certain varieties are regarded by gardeners as particularly suitable for forcing. The system pursued in the Orchard-house (q. v.) cannot be called forcing.

FORD, FORDING. When a river or rivulet is crossed without the aid of either a bridge or ferry, it is said to be forded, and an established place for this crossing is called a ford. Thus, we have Oxford, Stratford, Deptford, Hungerford, &c., towns built around ancient fords. To the military engineer and the traveller in wild countries, the selection of the safest place for fording a river is a matter of some practical importance. In the first place, the *widest* part of the river should be chosen, as, wherever a certain quantity of water is flowing, the wider its bed—the rapidity of the flow being the same—the shallower it must be. At the bend of a river, the line of shallow water does not run straight across, but extends from a promontory on one side to the nearest promontory on the other. The stream usually runs deep along hollow curves, and beneath steep perpendicular and overhanging banks, whilst it is always shoal in front of promontories, unless the promontory is formed by a jutting rock. For safe fording on foot, the depth of water should not exceed three feet; on horseback, four feet; or a foot less for each, if the current be very strong. The bottom of a ford should be firm and even; weeds, blocks of stone, &c., are serious obstacles, especially for cattle. When a caravan, a number of troops, or of cattle, have to cross, a sandy bottom is very bad, for the sand is stirred up and carried away by the stream, and renders the ford impracticable for the hindmost. For a small party, hard sand or gravel is the safest bottom.

The inhabitants of a district generally know the safest fords, and their experience affords a better guide than the best rules that can be given. Fords are contiually varying, either from the swelling of the river or the shifting of its bed or banks, and therefore it does not follow that the place set down by one traveller as a safe ford, will continue so for the next that succeeds him.

FORD, John, an English dramatist, was the second son of Thomas Ford of Ilsington, in the county of Devon. The date of his birth is not known, but he was baptized in Ilsington Church, 17th April 1586. His family was connected with the famous Lord Chief Justice Popham, and he became a member of the Middle Temple in November 1602; his cousin, a John Ford also, at the same period being a member of Gray's Inn. Unlike many members of the poetic tribe, F. seems to have adhered to his studies, and to have attained some professional success. His first poem was an elegy on the death of the Earl of Devonshire, entitled *Fame's Memorial*, and subsequently he assisted in the composition of various plays; perhaps, from his conjunction with Webster and Decker, in this way he acquired, or at least whetted, his appetite for tragic horrors. In 1629, he produced *The Lover's Melancholy;* and four years after, *The Broken Heart*, and *Love's Sacrifice.* Next year came *Perkin Warbeck;* and in 1638—1639, *The Fancies Chaste and Noble*, and *The Lady's Trial.* After this, F. drops out of literary history. Some think that he died soon after; others, that he retired to his native place, married, and lived to an old age, with sons and daughters growing up around him.

F. takes high position as a dramatist, and this position he attains more by general mental force than by dramatic instinct, or by what we are accustomed to call poetic genius. In his compositions, there is a sense of effort; his writing looks like task-work; and one can hardly suppose that he enjoyed his work. His versification—even when the subject-matter is distinctly noble—is hard and prosaic. He has no humour. He has been praised for his pathos, but in his pathetic scenes effort is apparent. He cannot 'flatter' you to tears, as Shakspeare and the greater poets do. An edition of his works, published by Edward Moxon of London (1840), is enriched by a biographical notice and critical estimate from the pen of Hartley Coleridge.

FORDUN, John of. Nothing more is certainly known of this early Scottish chronicler, than that he was a secular priest, and wrote about the year 1380. It has been inferred from his name that he was born at Fordun, in Kincardineshire, and it has been said that he was a canon of the cathedral church of Aberdeen. Having proposed to himself the compilation of a chronicle of Scotland, he is said to have travelled on foot through Britain and Ireland in search of materials. He lived to write only five books of his *Scotichronicon*, bringing the history down to the death of King David I. in 1153. He left collections extending to the year 1385, about which time he is supposed to have died. The work which John of F. had left unfinished was resumed in the year 1441 by Walter Bower, abbot of the monastery of Austin Canons Regular, at Inch Colm, or St Colm's Inch, in the Firth of Forth. He enlarged the five books which F. had completed, and making use of his collections so far as they went, wrote eleven new books, bringing the *Scotichronicon* down to the murder of King James I. in 1437. The dearth of other annals has given more importance to the work than it could claim from its literary merits, which are scanty enough. It has been printed more than once, the most complete edition being Walter Goodall's, published at Edinburgh in 1759, in two folios. This includes both F. and Bower. The best edition of F.'s work, as it was left by himself, is Thomas Hearne's, published at Oxford in 1722. There is room for a new edition, which should give a collation of the best manuscripts, and distinguish what is F.'s own, what he copied from others, and what Bower interpolated into his text.

FORE (i. e., first), a term applied to the front or foremost part of a ship. The *forehold* is that part of the hold intervening between the cutwater and the foremast. The *forecastle* is that portion of the upper deck extending from the foremast to the bow; it is the part to which the common sailors have free access, and probably derives its name from a small turret or castle placed near the prow in ancient vessels, from which darts and other projectiles could be most conveniently hurled upon an enemy. *Foremast* is the first of the three masts, or of the two, when only that number are present. It is surmounted by the foretop-mast, foretopgallant-mast, and foreroyal; its sails being foresail, foretopsail, &c.; between it and the bow flies the forestaysail, hoisted on the forestay, a massive rope passing from the foretop to the bow, and, with the backstays and shrouds, maintaining the mast in a perpendicular position. The *forebraces* are ropes passing from the extremities of the foreyard into the maintop, whence they descend through pulleys to the deck, where they serve, when necessary, to alter the direction presented by the foresail to the wind.

FORECLO'SURE, in English Law, the process by which a mortgagor failing to repay the money lent on the security of an estate, is compelled to forfeit his right to redeem the estate. Every person having mortgaged his estate, is entitled to an equity of redemption, which can only be cut off by a formal process. For this purpose, the mortgagor files a bill of foreclosure, praying that an account may be taken of the principal and interest due under the mortgage, and that the mortgagor, on failing to pay, may forfeit his equity of redemption. If on the day fixed for payment, the money be not forthcoming, the mortgagor will be declared to have forfeited his equity of redemption, and the mortgagee will be allowed to retain the estate in perpetuity. See Mortgage.

FOREHAND RENT. In Scotch Law, rent is said to be forehand when it is made payable before the crop, of which it is the rent, has been reaped. After the period when it is due and exigible, forehand rent is *in bonis* of the lessor, and passes to his executor, not his heirs (Bell's *Law Dictionary*).

FO'REIGN ATTA'CHMENT may have reference either to person or property. A defendant who has been arrested or attached in a foreign country, may be again arrested in England on the same ground of action. Thus, where a defendant had been arrested abroad on an English judgment, and escaped and came to England, the Court of Queen's Bench decided that he may be holden to bail in an action on the judgment. But after an arrest in Ireland or Scotland, the defendant cannot, in general, be again arrested in England for the same debt, neither of these countries being deemed foreign to that effect (Wharton's *Dic.*). Under the same name, a proceeding for securing the debts due to the defendant has been immemorially used in the cities of London and Bristol (Stephen's *Com.* iii. p. 663, *note*); and by the C. L. P. Act of 1854, a similar proceeding has been adopted, but with this difference, that whereas by a foreign attachment in the Lord Mayor's Court, debts are attached for the purpose of compelling the defendant to appear and put in bail to the action, no such proceeding can take place in the common-law courts till after judgment. See Garnishment. In Scotland, where a creditor may both incarcerate a debtor and attach his effects, an English creditor may attach the property of his debtor, though he has imprisoned him in England. See Attachment, Apprehend, Arrest, Foreign Courts. The corresponding phrase in Scotland is *Arrestment*, which has reference both to person and goods, and is a proceeding at common law applicable to the whole country. As to the validity of a Scotch arrestment, *ad fundandam jurisdictionem*, to enable the Scotch courts to proceed against a foreigner though absent, see the recent appeal case of the London and North Western Railway Co. *v.* Lindsay, Macqueen, iii. p. 99.

FOREIGN AUXI'LIARIES. In the early periods of English history, foreign auxiliaries were by no means uncommon. Harold had a body of Danes in his army when he defeated the Norwegian king; and to their refusal to march against the kindred Normans he owed not the least among the complications which ultimately overwhelmed him. Passing to modern times, William III. had for some time a body of Dutch troops in his pay as king of England: throughout the 18th c., Hessian and Hanoverian regiments were constantly in the pay of the English government for temporary purposes. Hessians fought for us in the first American war; and the Landgrave of Hesse, who sold his troops at so much a head, received upwards of half a million for soldiers lost in the campaign. During the Irish rebellion, again, in 1798, many Hessian troops were employed.

On the outbreak of the continental war in 1793, it was determined to recruit the British army by the addition of a large body of foreigners; and accordingly, in 1794, an act passed for the embodiment of the 'King's German Legion,' consisting of 15,000 men. These troops, who were increased in the course of the war to nearly double that number, distinguished themselves in various engagements, and formed some of the regiments on which our generals could best rely. Corps of French *émigrés*, as the York Rangers and others, were also organised. The whole of the foreign legions were disbanded in 1815, the officers being placed on half-pay.

During the Russian war, in 1854, the British government again had recourse to the enlistment of foreigners; special provision being made in the act authorising their employment, that the arms of the legionaries were in no case to be used against British subjects, in the event of internal discord. The numbers to be raised were 10,000 Germans, 5000 Swiss, and 5000 Italians; the pay to be the same as to British troops, but temporary service to convey no claim to half-pay. About half the number of men were enrolled, and were said to have reached great efficiency, when the stoppage of hostilities arrested their progress, and caused them to be disbanded at a great cost for gratuities, &c.

An attempt was made to locate the Germans as military settlers on the frontier of Cape Colony, where they should at once be a protection against the Kafirs, and a valuable addition to the labour in the eastern provinces; but partly from the paucity of females in their community, and partly from the temptation to abscond, offered by the high wages in other parts of the colony, Stutterheim, as the settlement was called, has had indifferent success. Many of the soldiers of the Italian legion subsequently turned their training to good account under Garibaldi.

Troupes étrangères form a permanent portion of the French army, where they are held in good esteem; they are usually Swiss, who are always willing to sell their services to any power, whatever the cause, provided only that the pay is good. The throne of the late Neapolitan monarchy was latterly upheld chiefly by Swiss mercenaries.

FOREIGN BILL OF EXCHANGE is a bill which is either both drawn and accepted abroad; or drawn by a person residing abroad on a person in this country, or the reverse. If a bill be drawn abroad, and accepted in England, it does not require a stamp; but if drawn in this country upon a correspondent abroad, or a foreign house, it must be stamped (19 and 20 Vict. c. 97, ss. 6 and 7); and when drawn abroad, it must be stamped by the holder, before he can present it for payment, or indorse, transfer, or otherwise negotiate it within the United Kingdom (Chitty on *Bills of Exchange*, 72). It has, however, been decided that the stat. 17 and 18 Vict. c. 83, s. 3, does not render a stamp necessary where a bill drawn abroad has been indorsed abroad to a person in England, and presented by him for acceptance in England (Phillimore, *International Law*, iv. 609). Formerly, a bill drawn or payable in Scotland or Ireland, was foreign in England; but such bills were made inland by the statute just mentioned; and the same regulation was extended to the islands of Man, Guernsey, Jersey, Alderney, and Sark (s. 7). See Bill. It has been established as a rule in England, that the liabilities of the drawer, the accepter, and indorser, shall be governed by the laws of the countries in which the drawing, acceptance, and indorsement respectively took place (Phillimore's *International Law*, iv. p. 606 and 506). In the case of bills which are both drawn and accepted abroad, and which are thus in reality foreign contracts, but of which the accepter is a native of this country, and which are sought to be enforced in the courts either of England or Scotland, a distinction is made between the contract and the remedy: 'Whatever relates to the nature of the obligation—*ad valorem contractus*—is to be governed by the law of the country where it is made—the *lex loci;* whatever relates to the remedy, by suits to compel performance, or by action for a breach—*ad decisionem litis*—is governed by the *lex fori*—the law of the country to whose courts the application is made for performance or for damages.' —Lord Brougham in Don *v.* Lippman, House of Lords, 26th May 1837; Shaw and Maclean, ii. p. 723.

FOREIGN COURTS. Kent, after stating that in cases not governed by the constitution and laws of the United States, the doctrine of the English law, as to the force and effect to be given to foreign judgments, is the law of his own country also, observes, that the law thus common to England and America 'is exceedingly, if not peculiarly liberal, in the respect which it pays to foreign judgments, in all other cases except the case of a foreign divorce or an English marriage. A distinction was early taken by Lord Nottingham, and is now recognised both in England and America, and indeed almost everywhere else, between a suit brought to enforce a foreign judgment, and a plea of a foreign judgment in bar of a fresh suit for the same cause. As the effect to be given to a foreign judgment is altogether a matter of comity, in cases where it has not been regulated by positive treaty, and no sovereign is bound to execute within his own dominions a sentence given out of it, the rule adopted, where a suit is brought to enforce a foreign judgment, is that the foreign judgment is to be received, in the first instance, as *primâ facie* evidence of the debt, but that the defendant is entitled to impeach the justice of it, or to shew that it was irregularly and unduly obtained. But the case is different where the losing party comes forward and wishes to institute a new suit upon the same matter, and to open up a foreign judgment dismissing the action, pronounced by a competent court. In this case, to interfere with the foreign judgment would be to assume the attitude of a court of review, and the rule in England, consequently, is that such a decision, when given by a foreign court, is final and conclusive. So obvious, indeed, is the convenience and necessity of this rule, that it has been regarded as forming a portion of general jurisprudence.'—Kent's *Com.* ii. 101, 102. As regards the enforcement of foreign decrees and judgments, the usages of nations have differed considerably, and the subject is far too wide and too difficult to admit of being satisfactorily discussed in this work. The distinction between the recognition of the judgment of a foreign court, as determining the validity of a foreign contract, and the application of a foreign remedy by the courts of this country, has been pointed out under Foreign Bill of Exchange (q. v.). For practical purposes, however, it may be convenient that we should state that, contrary to the popular belief in England, the French courts are in the habit of giving effect to judgments obtained in England, and that debtors cannot escape from their creditors, as is too generally supposed, by simply crossing the Channel. The difficulty, no doubt, still exists where the debtor has escaped before any proceedings could be taken against him in this country, and where no judgment can be obtained. But if he has once been served with process in England, or cited either edictally or otherwise in Scotland, the creditor may go on with his action against him though he be personally absent from the country, and ultimately enforce his decree against him by the interposition of a French court. The same observations apply to Belgium. In England, there is no regular office, as in Scotland, for the publication of citations to persons abroad (see Edictal Citation), but leave to substitute service at the last place of abode, in place of personal service, may now be obtained in some cases from the courts, or leave may be granted to serve out of the jurisdiction. In most countries, the rule as to two foreigners resident but not domiciled is, that they may sue each other in the ordinary courts, as natives do. To this the French courts are an exception, and hold themselves incompetent to entertain suits between undomiciled foreigners relating to personality, except in matters of commerce (Phillimore, *International Law*, iv. 645). See Jurisdiction; Domicile; International Law, Private; Conflict of Laws, &c.

FOREIGN ENLI'STMENT ACT. In the law of England, there is a statutory prohibition of enlistment in the service of a foreign prince in 3 Jac. I. c. 4, s. 18; but the statute commonly known as the Foreign Enlistment Act is 59 Geo. III. c. 69. It provides that if any natural-born Englishman shall enter into the service of any foreign state, either as a soldier or a sailor, without the licence of his majesty, or an order in council or royal proclamation, or if any person within the British dominions hire or attempt to hire any person to enlist in the service of a foreign state, such person shall be guilty of a misdemeanour. The officers of the customs, on information on oath, may detain any vessel having persons on board destined for unlicensed foreign service. Masters of vessels, knowingly having such persons on board, are subjected in a penalty of £50 for each individual. Persons fitting out any vessel for foreign service, without licence, are guilty of a high misdemeanour, and the ship and stores are forfeited. Even to assist a foreign state with warlike stores, without licence, is a misdemeanour punishable with fine and imprisonment. These penalties are irrespective of any consequences that may follow to the individual for having committed a breach of international law.

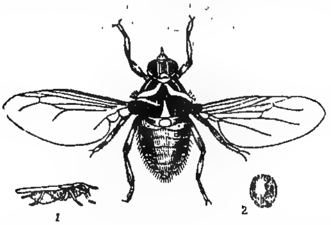
FOREIGNER. See Alien.

FO'RELAND, North and South, two promontories on the east coast of Kent, between which are the Downs and Goodwin Sands. North F., the *Cantium* of Ptolemy, forms the north-east angle of the county and of Thanet Isle, in lat. 51° 22′ N., and long. 1° 26′ E., two miles east of Margate. It consists of chalky cliffs, nearly 200 feet high, projecting into the North Sea, and has a light-house with a fixed light, 184 feet high, and seen 24 miles off. South F., also composed of chalk-cliffs, is 16 miles south of North F., 3 miles north-east of Dover, in lat. 51° 8′ N., and 1° 22′ E. It has two fixed lights, respectively 380 and 275 feet above the sea, and seen from a distance of 25 and 22 miles. From this point, there is often a magnificent view of 200 to 300 merchantmen passing by, after having been detained by contrary winds in the Downs.

FO'RELOCK is a flat wedge driven through the end of a bolt to prevent its withdrawal: it is used principally on board ship.

FORESHO'RTENING, a term in Painting or Drawing, applied to signify that a figure, or a portion of a figure, which is intended to be viewed by the spectator directly or nearly in front, is so represented as to convey the notion of its being projected forward; and, though by mere comparative measurement occupying a much smaller space on the surface, yet to give the same idea of length or size as if it had been projected laterally. In compositions of figures and groups on ceilings, and in the interior of domes, &c., numerous examples will be found in which this art has been put in practice; in the works of Raphael, foreshortening is practised with most judgment and correctness; those of M. Angelo, Correggio, and Tintoretto display the greatest boldness; but the three last-named artists have been censured for introducing foreshortening too frequently into their compositions, for the purpose of parading their skill in practising it.

FOREST FLY (*Hippobosca equina*), an insect of the order *Diptera*. It receives the name F. F. from its frequent occurrence in forests, and particularly in the New Forest, Hampshire. It is also sometimes called Horse Fly, from the annoyance which it gives to horses. It is a small insect, about four lines long; its wings, two in number, much exceeding the length of the abdomen. When at rest, the wings are laid flat on the back, one overlapping the other. The general colour is brown, the thorax varied with pale yellow, the legs ringed with yellow and brown. The legs terminate in hooked claws. The skin is leathery and remarkably tough, so that the insect cannot be killed by any ordinary amount of squeezing. The structure of the mouth differs much from that of ordinary dipterous insects, and bears no inconsiderable resemblance to that of fleas. The F. F. lives by sucking the blood of quadrupeds, sometimes of oxen, dogs, &c., but most of all of horses. High-bred horses with smooth hair are most liable to this annoyance. The female F. F. does not deposit her eggs until they have reached the pupa stage in her abdomen. One only is produced at a time, enclosed in a tough, strong skin, egg-like, black, and shining like a bead, wonderfully large when the size of the abdomen from which it came is considered; the perfect insect finally emerges by bursting open a kind of lid or cap.



Forest Fly (*Hippobosca equina*), magnified;
1, natural size; 2, the pupa, as deposited by the mother.

FOREST LAWS, in England, laws for the regulation of the royal forests. Forest is defined by Lord Coke to be a safe preserve for wild animals (*feræ*) of the chase, whence comes the term *foresta*, by the change of *e* into *o* (*Co. Litt.* 233 a). Both words probably spring from the same root as the Latin *foris* and the French *hors*, and signify that which is *without* the range of the peopled or cultivated country. Hence the Italian *forestiere* and *foresto*, and the Spanish *forestero*, signify strange, foreign, wild, and the like. A forest, in the sense of the law of England, is a large tract of open ground, not necessarily covered with wood, but usually containing woodland interspersed with pasture, and forming part of the property of the monarch, and governed by a special code, called the forest law. This particular law had reference not only to matters connected with hunting and the like, but generally governed the persons living within the forest in all their relations. A chase is a smaller forest, in the hand of a subject, but not governed by forest law. Though the privilege of forest belongs of right to the sovereign alone, it may be granted by him in favour of a subject, who becomes entitled to exercise the privileges of forest in the district assigned. This right was exercised by the Saxon kings, who reserved large tracts of country for the royal pastime of hunting, and a charter of the forest was said to have been passed by Canute at Winchester in the year 1016. But the authenticity of this document is doubted by Lord Coke (*Inst.* iv. 320). William the Conqueror greatly extended the royal forests, by laying desert vast districts in Hampshire and Yorkshire; he also introduced penalties of the severest kind for offences against the game. The penalty for killing a stag or boar was loss of eyes; for William loved the great game as if he had been their father (*Sax. Chronicle*). It was not till the reign of Henry III. that the laws of the forest were reduced into a regular code. In the reign of that monarch was passed the charter of the forest, 9 Henry III. (A. D. 1224). The right of the sovereign to create a forest is by the common law confined to lands of his own demesne. Henry II. had arbitrarily exercised his power by afforesting the lands of his subjects; but by the 1st and 3d chapters of the charter of the forest, it is provided that all forests so made should be disafforested. At a subsequent time, when Henry VIII. created Hampton Court Forest, he was obliged to obtain the consent of the freeholders before he could erect a chase or forest over their grounds (Coke, *Inst.* iv. 301). Mr Hallam remarks: 'It is well known that Charles I. made Richmond Park by means of depriving many proprietors not only of their common rights, but of their freehold lands. It is not clear that they were ever compensated; but I think this probable, as the matter excited no great clamour in the Long Parliament.'—Hallam, *Const. Hist.* i. 463, note, 1st ed. By the charter of the forest, the penalties for destroying game are greatly modified. By cap. 10, it is provided that no man shall lose life or limb for slaying deer, but that the punishment shall be restricted to fine or imprisonment for year and day. Cap. 11 contains the following curious privilege: 'Whatsoever archbishop, bishop, earl, or baron, coming to us at our commandment, passing by our forest, it shall be lawful for him to take and kill one or two of our deer by view of our forester if he be present; or else he shall cause one to blow an horn for him, that he seem not to steal our deer; and likewise they shall do returning from us.' This law is still unrepealed; so that a bishop may kill the Queen's deer when summoned to, or returning from parliament. Charles I. attempted to fill his empty exchequer by imposing penalties and exacting fines for alleged encroachments on the ancient boundaries of the forests, though the right to the lands thus taken was fortified by possession for several centuries. This was one of the first grievances with which the Long Parliament dealt, and since the passing of the act for the 'certainty of forests' (16 Car. I. c. 16), the laws of the forest have practically ceased. In Coke's time, there were sixty-nine royal forests, all of which, with the exception of the New Forest and Hampton Court Forest, had been created before the period of record. Of these, the principal were—the New Forest, Sherwood, Dean, Windsor, Epping, Dartmoor, Wichwood, in Oxfordshire, Salcey, Whittlebury, and Rockingham, in Northamptonshire, Waltham, in Lincolnshire, and Richmond, in Yorkshire. During the present reign, several of the royal forests have been disafforested by act of parliament—Hainault, 14 and 15 Vict. c. 43; Whittlewood, 16 and 17 Vict. c. 42; Wichwood, 19 and 20 Vict. c. 32. Public necessity is the plea on which these spots, long so famous for their silvan scenery, have been condemned. The plea is one which cannot be altogether disregarded; but it is to be hoped that it will not be suffered to prevail to the entire destruction of our royal forests, some of which, from their vicinity to large towns, afford resorts for public recreation highly prized by the citizens, and which never can be equalled in beauty and in healthfulness by any new-made pleasure-ground.

The royal forests of Scotland, in ancient times, seem to have been nearly as numerous as those of England. In Perthshire, there were the forests of Athole, Mamlorn, Glenartney, Glenfynlas, Glenalmond, Birnam, Cluny, Alyth, &c. In Forfarshire, there were Platan, Montrethmont, Kilgerry; in Kincardineshire, Cowie and Durris; in Aberdeenshire, the Stocket, Dyce, Kintore, Benachie, Drum, Birse, Braemar; in Banffshire, the Boyne and the Enzie; in Morayshire, Darnaway, &c. South of the Forth, there were the forests of the Torwood, Cadzow, Ettrick, Selkirk, Jedburgh, Traquair, the New Forest in Dumfriesshire, &c. The *Leges Forestarum*—the Scottish Forest Laws—have been printed more than once; the best edition is in *The Acts of the Parliaments of Scotland*, vol. i. pp. 323—328 (Edin. 1844). The forest code of Scotland, though neither so complete nor administered with the same rigour as that of England, was still generally complained of for its severe penalties or vexatious restraints. The grant of a right of forestry conferred the same privilege as if the ground over which it extended had been originally, and had continued to be, a king's forest. Hence arose great oppression and annoyance to neighbouring proprietors, and in 1680 the supreme civil court suggested that a representation should be made to the king against the granting of new forests. From a case which has just been decided, it would seem that the high pretensions of royal foresters have in some places survived to the present day. The Dukes of Athole still hold the extensive mountainous district called the forest of Athole, either in their own right or as foresters for the crown. In virtue of his rights of forestry, the present duke claimed the power of preventing his neighbour, the Laird of Lude, from killing deer on his own lands, and maintained that he was bound to allow the duke and his keepers to enter on his lands, and drive back any deer that might stray upon them from the forest of Athole. But the court decided (March 1, 1862) against the duke on both points.

Forest Courts were courts established for the purpose of enforcing the forest laws in the royal forests. Of these courts, there were in England four—viz., the Court of Attachments, the Court of Regard, the Court of Swainmote, and the Court of the Lord Justice in Eyre in the Forest, or Justice Seat. The last Court of Justice Seat that was held where business was transacted was in the reign of Charles I., before Lord Holland.

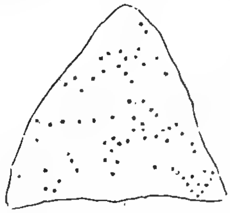
FOREST MARBLE, a member of the Lower Oolite, so called because of the occurrence of the typical beds in Wichwood Forest, Oxfordshire. The principal bed is a fissile limestone, containing large numbers of dark-coloured shells, and capable of sustaining a fine polish. On this account, it is used to some extent as 'marble.' It is interstratified with blue marls and shales, and fine oolitic sandstones. The whole thickness of the group seldom exceeds forty feet.

FOREST OAK, a name sometimes given in commerce to the timber of *Casuarina torulosa*, and other species of *Casuarina* (q. v.), Australian trees. This timber, which is light yellowish brown, and prettily marked with short red veins, is imported into Britain, and used for ornamental work.

FORESTA'LLING. See Engrossing.

FORESTS. See Arboriculture.

FORESTS, Fossil, have been frequently observed in the coal measures. The seams of coal having in general been formed from the vegetation of the locality where they occur, it is to be expected that when the coal is removed, the stools and roots of the trees would be observed in the immediately subjacent bed of shale—the ancient soil. Such a forest was laid bare in an open work at Parkfield Colliery, near Wolverhampton, in 1844. In the space of about one-fourth of an acre, the stumps of 73 trees, with their roots attached, appeared as shewn in the annexed ground-plan. The trunks, broken off close to the root, were lying prostrate in every direction, often crossing each other. One of them measured 15, another 30 feet in length, but they were generally shorter. They were invariably converted into coal, and flattened to the thickness of 1 or 2 inches. The upright stems shew that some of them had a circumference of more than 8 feet. Similar fossil forests have been observed in the coal-fields of Nova Scotia, and have been carefully described by Lyell, Logan, and Dawson. The usual height of the trees observed by Lyell was from 6 to 8 feet; but one tree was about 25 feet high, and 4 feet in diameter. Brogniart describes the remains of a fossil forest preserved in an upright position, in strata of micaceous sandstone, belonging to the coal measures at St Etienne, near Lyon. Though most abundant in strata of the carboniferous period, fossil forests have been observed in other formations. The Dirt-bed (q. v.) of the Lower Purbeck series is the remains of an ancient forest. Instances are also abundant in the pliocene strata. Sometimes, as on the coast of Devonshire and on the shores of the Firth of Tay, they are exposed on the surface, stretching from high-water mark to far below the furthest limit of low water; or they are exhibited in section, as in the cliffs of Eastern Norfolk, where, resting on the chalk or crag, there is a stratum in which the stools and roots of the trees stand in their natural position, the trunks having been broken short off, and imbedded with their branches and leaves. This stratum is covered with fresh-water beds and drift. The position of these forests indicates a variation, in recent geological time, of the relative level of land and water. The instances in Devonshire and Fifeshire may imply a simple subsidence of the land; at Norwich, however, a considerable depression must have taken place, to admit of the deposition of the fresh-water beds and the till, and a subsequent elevation, to expose the beds so high above the sea-level.



Ground-plan of the Fossil Forest at Parkfield Colliery.

The remains of ancient forests, belonging to a yet later period, are to be found in beds of peat. There is good evidence that some kinds of peat had their origin in the destruction of forests. Trunks and branches of beech, hazel, fir, &c., are found in them, and their roots may be traced in the underclay. The rapidity with which this peat is formed is very remarkable. At Blair-Drummond, the stratum of peat is eight to ten, and in some places even twenty feet in thickness. Many of the trees here have been felled with the axe, and that this was done while the Romans were in possession of the country, is proved by the discovery of 'corduroy roads,' leading from one camp to another, and the finding of camp-kettles at the bottom of the peat.

FO'RFANG, or **FOREFANG** (Sax. *fore*, before, and *fangen*, to take), the taking of provisions from any one in fairs or markets, before the king's purveyors were served with necessaries for his majesty. (Charter of Henry I. to the hospital of St Bartholomew in London, anno 1133, referred to in Tomlin's *Dic.*) It is also used to signify the rescuing of stolen or strayed cattle from a thief, or from those having illegal possession of them; or the reward fixed for such rescue (Wharton's *Dic.*).

FO'RFAR, supposed to be the ancient *Orrea*, the county town of Angus or Forfarshire, situated near a small lake of the same name, on a rising-ground of no great height, in the fertile valley of Strathmore. Pop. (1861) 9258. It has been a royal burgh since the reign of King David I. (1124—1153). It had a royal castle, of which no vestige remains, said to have been situated on a round hill, on the north side of the town, and to have been destroyed by order of King Robert Bruce, in the year 1307. Its staple manufacture is linen.

It is connected by railway with Aberdeen, Arbroath, and the south. It joins with Montrose, Arbroath, Brechin, and Bervie, in sending a representative to parliament.

FORFARSHIRE, or ANGUS, is a maritime county in the east of Scotland, being bounded on the E. by the German Ocean, on the N. by Kincardine and Aberdeen shires, on the W. by Perthshire, and on the S. by the Firth of Tay. It extends from north to south 38 miles, and from east to west 27 miles, with 45 miles of coast. There are several valleys of considerable extent, the principal of which are Glen Isla, Glen Prosen, Glen Esk, Clova, and Lethnot, which are all well watered, and mostly productive. The surface of the county is irregular, and it is intersected with hills, the Sidlaw being 1400 feet high, and Catlaw, the highest, 2264 feet. The soil, which is various, ranging from the finest alluvial to the moorish, rests mostly on the old red sandstone and the trap. Devonian paving-stones, limestone, porphyry, and jasper, occur. The chief rivers are the Tay, North Esk, South Esk, and Isla; and there are some small lochs. F. is the chief seat of the Scotch linen manufacture. Cattle, corn, salmon, and paving-stone are the principal exports. The climate partakes of the qualities common to the east coast. The average of the fall of rain is about 25 inches. In 1857, the last year in which the agricultural statistics were taken, the number of acres under tillage was 223,245½, the chief crops being 20,371 acres of wheat, 22,947½ barley, 51,104¾ oats, 34,693¾ turnips, 12,963 potatoes, 77,401¾ sown grasses. The average produce per acre of wheat was 26 bushels 2½ pecks; barley, 32 bushels 2 pecks; oats, 37 bushels 2 pecks; turnips, 13 tons 6¼ cwt.; potatoes, 2 tons 14¼ cwt. There were 2109 occupants above £10, and 5843 acres were occupied by tenants below £10 of rent. F. contains 54 parishes. Pop. (1861) 206,696, being an increase over that of 1851 of 13,064. In 1851, there were 187 places of worship (67 Established, 51 Free, and 23 United Presbyterian); 303 day-schools, with 22,120 scholars. The chief towns are Dundee, Arbroath, Montrose, Forfar (the county town), Brechin, and Kirriemuir. The county returns one member to parliament, and the boroughs two. Angus was the province of a *Mormaer* during the Celtic period of Scottish history. It appears as an earldom in the 12th century. Its first earls were probably the descendants of the old *Mormaers;* it passed subsequently to the Umphravilles, the Stewarts, and the Douglases. The castle of Forfar was the residence occasionally of some of the kings, until the time of Alexander III. The chief antiquities are some Roman camps, the vitrified fort of Finhaven, the remarkable stone forts of the White Caterthun, near Brechin, and of the Laws, near Dundee; the sculptured stone pillars at Meigle, Aberlemno, St Vigean's, Glammis, Kirriemuir, Aldbar, Invergowrie, &c.; the fortified island of St Margaret's Inch in the Loch of Forfar, the round tower and cathedral of Brechin, the ruins of Restennet Priory and Arbroath Abbey; and the old baronial castles of Glammis, Red Castle, Edzell, Melgund, Finhaven, Airlie, Careston, Inverquharity. At Stracathro, it is said Baliol resigned the crown to Edward I. Several eminent men were born in this county; among whom may be mentioned Hector Boece, Andrew Melville, the Marquis of Montrose, Joseph Hume, Sir Alexander Burnes, Robert Brown the botanist, James Mill the historian of British India; and Graham of Claverhouse had a seat at Fintry Mains.

FORFEITURE AND CORRUPTION OF BLOOD are penalties consequent on convictions for treason or felony. The penalty of forfeiture for treason is founded on this consideration, that he who hath thus violated the first principles of government, and broken his part in the original contract between king and people, hath abandoned his connection with society, and hath no longer any right to those advantages which before belonged to him purely as a member of the community (Stephen's *Com.* iv. 497). The penalty of forfeiture for treason prevailed in England before the Conquest, as is clear from the fact, that lands held in gavelkind, which is a Saxon tenure, may be forfeited for treason. But after the Conquest, forfeiture of lands and goods came to be regarded as the peculiar punishment of felony, of which treason against the sovereign was the highest kind, and was denominated high treason, to distinguish it from all other felonies, which were called petty treason. In cases of treason, the offender forfeits all his lands absolutely to the crown. In felony, according to the old law, the offender forfeited to the crown the profits of all estates of freehold during his life, and all his estates in fee-simple for a year and a day, after which they became escheat to the lord. The crown, during the year of occupancy, was entitled to commit upon the lands what Waste (q. v.) it pleased. By *Magna Charta*, this power of committing waste was restrained. But by 17 Ed. II. c. 16, the king's title to waste was again recognised. As the law now stands, murder is the only felony by which forfeiture for year and day is incurred. In all felonies, the goods and chattles of the offender are, on conviction, forfeited to the crown; but until conviction, forfeiture of the goods does not operate. Where, therefore, a person has disposed of his goods before conviction, the crown cannot reach them. Forfeiture of lands does not take effect until sentence of Attainder (q. v.) has been pronounced. So that a person committing *Felo de se* (q. v.), or a rebel dying before sentence, or killed in open rebellion, does not forfeit his lands. But sentence of attainder, as soon as pronounced, has a retro-active effect, and annuls all conveyances made between the act of treason or felony and the pronouncing of sentence. Conveyances made before the act of treason are not affected. Hence, a wife's jointure is not forfeited, because settled on her before the commission of the act. But dower is forfeited by 5 and 6 Ed. VI. c. 11. Counterfeiting the coin was formerly treason; but by various statutes, it is provided that the wife's dower should not be forfeited, and that the lands should be forfeited only for the life of the offender. Forfeiture for treason and felony is accompanied by *corruption of blood*, whereby the offender is incapable of inheriting any lands or of transmitting any title to an heir. But where the lands were not vested in the offender at the time of the act, they are not forfeited to the crown, but to the overlord. In England, this distinction is of little moment, except in copyhold lands, the crown being, in fact, the overlord of nearly all the freehold land in the kingdom. By 7 Anne, c. 21, it was enacted that, after the death of the Pretender and his sons, no attainder for treason should operate to the prejudice of other than the offender himself; but this provision was repealed, 39 Geo. III., c. 93. But in Scotland, where subinfeudation still subsists, the distinction is of practical importance. In Scotland, before the Union, forfeiture of estate was incurred on account of treason and certain other crimes, as theft by a landed man, and uttering false coin. Lord Stair is of opinion that the doctrine of corruption of blood did not prevail in Scotland to exclude those claiming, through a person attainted, where the offender was only apparent heir (Stair, iii. 3, 38). Since the Union, the law of Scotland in regard to forfeiture for treason has been assimilated to that of England.

In America, forfeiture of estate for crimes is very much reduced, and the corruption of blood is universally abolished. Several of the state constitutions have provided that no attainder for treason or felony shall work corruption of blood or forfeiture of estate, except during the life of the offender, and some of them have taken away the power of forfeiture absolutely, without any such exemption. Every person convicted of any manner of treason, under the laws of New York, forfeits his goods and chattels, and also his lands and tenements, during his lifetime; but the rights of all third persons existing at the time of the commission of the treason, are preserved. Kent's *Commentaries*, ii. 505.

FORFEITURE OF LANDS was originally a penalty of the feudal law, incurred on account of some act by the tenant inferring disloyalty to his overlord. The acts inferring forfeiture might be of either a civil or a criminal nature. Forfeiture for crimes was incurred by treason or felony. See Forfeiture and Corruption of Blood. Civil forfeiture may be incurred in England in three ways—viz., by tortious alienation, by wrongful disclaimer, and by alienation in mortmain; the first two of these modes were incidents of the feudal tenure, the latter was introduced by statute. It must be observed that, according to the earliest feudal customs, a gift of lands was always made in favour of a particular person, and that alienation, without consent of the overlord, involved a forfeiture of the fee. But this strictness having by degrees ceased to be observed, forfeiture was only incurred in case of a tortious alienation. Tortious alienation was where the owner of a particular estate conveyed by common law conveyance, as feoffment, fine, or recovery, a greater estate than that to which he was himself entitled, as where a tenant-for-life made a feoffment in fee. The immediate effect of this act was the forfeiture of the land to the remainder man or reversioner. By 3 and 4 Will. IV. c. 74, abolishing fines and recoveries, and 8 and 9 Vict. c. 106, s. 4, declaring that a feoffment should not have a tortious operation, forfeiture by tortious alienation has ceased to have a practical importance. Forfeiture by wrongful disclaimer was where a tenant holding under a superior lord, on being summoned in any court of record, either disclaims his allegiance, or does any act which amounts to a disclaimer. Since the abolition, by the statute of *quia emptores*, of subinfeudation, this species of forfeiture can only arise in lands held of the crown. Forfeiture by alienation in mortmain is incurred by the conveyance of lands or tenements in favour of any Corporation (q. v.), sole or aggregate, ecclesiastical or temporal. As by vesting the land in a tenant of this description, the overlord was deprived of all the duties and services due by his vassal, this act was declared by various acts of parliament to infer the forfeiture of the lands. See Mortmain. Forfeiture of copyholds was incurred by committing waste, and by other acts of a wrongful kind inconsistent with the fealty due to the lord. See Blackstone, *Com.* ii. 284. Forfeiture on breach of condition, subsequent is where an estate is held upon a condition contained in the grant itself. On failure of the condition, the grantor or his heirs may enter upon the lands.

In Scotland, civil forfeiture may arise either from statutory enactment, at common law, or by agreement. By 1597 c. 246, it is enacted that vassals failing to pay their feu-duties for two years shall forfeit their right. This forfeiture must be established by an action to recover the feu-duties in arrear, and may be avoided by payment at the bar. At common law, a vassal forfeited his land by disclamation or purpresture. The former is analogous to the English disclaimer, and consists in the denial by a vassal of his lawful superior. Purpresture was incurred by the vassal's encroachment on the streets, highways, or commonties belonging to the crown or other superior. These forms of forfeiture are fallen into disuse. Forfeiture on special agreement depends wholly upon the terms of the condition inserted in the titles to the land. The condition must be fortified by irritant and resolutive clauses, and must enter the sasine, in order that it may be effectual against purchasers of the lands (Erskine, ii. 3, s. 13). Of this kind of forfeiture are breaches of Entails (q. v.).

FORGE, FORGING. The process of hammering red-hot iron or steel into any required shape is called Forging, and the workshop in which the operation is performed, a Forge. The principal tools of a common smith's forge are the forge-fire or hearth, with its bellows, the anvil, and the various hammers, swages, &c. For large work, an air-furnace, blown by steam-bellows, supplies the place of the simple hearth of the blacksmith, powerful cranes swing the work to its place on the anvil, and a steam-hammer (see Hammer) strikes the blows that squeeze the red-hot mass into shape. Besides these, there are portable forges of various sizes and forms, used for military and other purposes. They usually consist of an iron frame, to which a bellows, worked by the foot, is attached; and above the bellows is an iron tray, with a hearth, &c., upon which the fire is made; and the anvil is either attached to this frame, or has a separate stand.

Under Cutlery, the general method of forging small work is described. For the largest work to which hand-hammers are still applied, such as anchor-forging, two gangs of from six to twelve hammermen are employed; they swing the large hammers with such wonderful precision and regularity, that the instant one hammer is withdrawn, another falls upon the same place. A foreman, with a wand, directs the hammering. The two gangs relieve each other alternately, on account of the great severity of the labour. Shovels, spades, mattocks, and many other tools and implements, are partly forged under the tilt-hammer. See Steel.

In all processes of forging, it is of primary importance to obtain the greatest possible rapidity in the succession of the blows. There is a double reason for this: first, and simply, that the work is cooling, and the more slowly it is forged, the more frequently it must be re-heated; and secondly, that percussion generates actual heat, and if the blows are sufficiently heavy and rapid, the temperature of the work may be fully maintained out of the fire for a considerable length of time. The hammer used for tilting steel not only maintains the heat of the bar, but raises it from a dull to a bright red heat.

FORGERY (Fr. *forger*, to form metal into shape; to fabricate), the *crimen falsi* of the Roman law, is held in England, at common law, to be the fraudulent making or altering of a writing or seal, to the prejudice of another man's right, or of a stamp to the prejudice of the revenue. As regards writings, the instrument forged must be executed with such skill or in such circumstances as to be capable of being mistaken for a genuine document by a person of ordinary intelligence and observation. It is not necessary that there should be even an attempt at imitation. If there was intention to deceive, and the circumstances were such as to render deception possible, the crime has been committed, and it has consequently been held in Scotland that it is possible to forge the name of a person who cannot write (1 Alison, p. 372), and further that the crime may be committed by the adhibition of a cross or mark (Macmillan, January 24, 1859). Any material alteration, however slight, is a forgery just as much as the subscription of the name of the pretended maker, or the fabrication of the entire deed. It will not lessen the crime, though the whole deed should be genuine, the name only being forged, or the name being really the handwriting of the party to whom it belongs, but appended to a forged deed. Even if the name be a fictitious one, but appended for the purpose of deceiving, a forgery has been committed just as much as if it belonged to a real person. Long before the recent extensions took place in the law of evidence, by which parties were admitted as witnesses in their own causes, it was provided by 9 Geo. IV. c. 32, that the party whose name had been forged might be a witness to the effect that the writing was not his. But, on the other hand, it is an established rule of law that the proof of forgery, by a mere comparison of handwriting, is incompetent (Tailor on *Evidence*, p. 1428, n. 5, 2d ed.). Identification of handwriting is, if possible, more difficult than identification of the person, which so often forms the chief difficulty in criminal trials. 'As illness, strange dress, unusual attitude, and the like, cause mistakes in identifying the individual, so a bad pen, or rough paper, a shaking hand, hurry, and many other things, change the appearance of a person's handwriting.'—Dickson on *Evidence*, p. 474. There are besides resemblances in handwritings proceeding from many accidental causes, so that much caution is necessary in weighing this kind of evidence. 'It ought never, therefore, to be regarded as full proof by the crown in criminal trials, and even in civil cases, corroborative evidence should be required, unless the proof of handwriting is so clear as to shift the *onus probandi*.' Though writing-masters, engravers, bankers' clerks, and other persons in the habit of examining handwritings are often adduced as witnesses in trials for forgery, their evidence is really of very little value, and generally so conflicting that it can be produced with equal effect on either side. The best witness is one who has often seen the party write, through whose hands his writing has been continually passing, and whose opinion is not the result of an inspection made on a particular occasion for a special purpose. The act 11 Geo. IV., and 1 Will. IV. c. 66, makes the forging of the great seal, the privy seal, or any privy signet, the sign-manual, the seals of Scotland, or the great seal and privy seal of Ireland—treason. The same statute declares the offence of forging, or uttering with intent to defraud, stamps, exchequer bills, Bank of England notes, bills of exchange, promissory notes, deeds, receipts, orders for the payment of money, transfers of stock, wills, &c., to be felony. Capital punishment was first abolished with regard to special cases of forgery by 2 Geo. IV., and 1 Will. IV. c. 66, and 2 and 3 Will. IV. c. 123; and then altogether done away with by 7 Will. IV. and 1 Vict. c. 84. The offender is now liable to penal servitude, the length of which is at the discretion of the court; but which cannot be for less than three years, or he may be imprisoned for not more than four, or less than two years, with or without hard labour and solitude. As to the forgery of Bank of England notes, see 16 Vict. c. 2. As to obtaining property by false pretences, see Fraud.

FORGET-ME-NOT, or SCORPION GRASS (*Myosotis*), a genus of annual or biennial herbaceous plants, of the natural order *Boragineæ*, with 5-cleft calyx and salver-shaped corolla; the flowers small, and generally blue. The genus is diffused over the temperate zone in all quarters of the world, and a number of species are common in Britain, chiefly growing in ditches and damp meadows—as *Myosotis palustris*, with crooked creeping perennial roots—an angular stem of a foot in height, and calyx covered with appressed bristles. *M. sylvatica*, with calyx covered with stiff spreading hairs, grows in bushy places and woods, and is often planted in flower-gardens. The dark blue F. of the Azores (*M. Azorica*) has of late begun to be cultivated in Europe, but requires the green-house. The genus is a favourite one with most persons, both because of the brilliancy of the flowers, and because throughout Europe it is generally regarded as the emblem of friendship. The English name Scorpion Grass is now seldom heard. The German name *Vergiszmeinnicht* corresponds with the English *Forget-me-not*.—*M. versicolor*, very common in Britain, often as a weed in gardens, is remarkable for the change of colour in the flowers, which are first yellow, then blue. They are very small.—*M. alpestris*, found on some of the mountains of Scotland, is especially admired for the size and brilliancy of its flowers.

FORIO, a thriving town of Italy, is picturesquely situated on the west coast of the island of Ischia, which stands at the northern side of the mouth of the Bay of Naples. The central portion of the town consists of very narrow streets, but the suburbs are composed of charming white cottages. It has three highly decorated churches, a good harbour, and some trade with Leghorn, Naples, and Genoa. Pop. 6500.

FORISFAMILIA'TION (literally, the putting forth from or beyond the family) is the separation of a child from the family of his father. A child is said to be forisfamiliated, either when he marries or when he receives from his father a separate stock, the profits of which are enjoyed by himself, though he may still reside with his father, or when he goes to live in another family with the consent of his father. The same result is also brought about when a child renounces his *legitim*, i.e., his legal share of the father's free movable property due to him on the death of the latter. See Bell's *Dic. of the Law of Scotland*.

FORKS. These table instruments are only about three centuries old. The Greeks, Romans, and other ancient nations knew nothing of forks. They had large forks for hay, and also iron forks for taking meat out of pots, but no instruments of the nature of table-forks. In ancient times, as is the practice still in the East, meat was commonly prepared as stews; or if roasted, it was cut into small pieces by a carver, so as to be easily taken in mouthfuls by the guests, who used their fingers and a knife for the purpose. It certainly is a strange fact, that the use of any species of forks at table was quite unknown till the 15th c., and they were then known only in Italy, which has the merit of this invention. None of the sovereigns of England had forks till after the reign of Henry VIII.; all, high and low, used their fingers. It was accordingly a part of the etiquette of the table to employ the fingers so delicately as not to dirty the hand to any serious degree; but as even by the best management the fingers were less or more soiled, it was the custom to wash the hands immediately on the dishes being removed from the table. Hence, in the royal household, there was a dignitary called the *Ewrar* or *Ewary*, who with a set of subordinates attended at meals with basins, water, and towels. The office of Ewary survived after forks came partially into use. We learn that when James I. entertained the

Spanish ambassador at dinner, very shortly after his accession, 'their majesties washed their hands with water from the same ewer, the towels being presented to the king by the lord treasurer, and to the queen by the lord high admiral.' The Prince of Wales had a ewer to himself, which was after him used by the ambassador.—Ellis's *Letters.* The first royal personage in England who is known to have had a fork was Queen Elizabeth; but although several were presented to her, it remains doubtful whether she used them on ordinary occasions. From the inventory of her majesty's appointments in Nichols's *Progresses*, it would appear that these forks were more for ornament than use. '*Item*, a knife and a spoune, and a forke of christall, garnished with golde sleightly, and sparcks of garnetts: given by the Countess of Lyncolne. *Item*, a forke of corall, slightly garnished with golde: given by Mrs Frances Drury. *Item*, one spoune and forke of golde; the forke garnished with two lyttle rubyes, two lyttle perles pendant, and a lyttle corall: given by the Countess of Warwicke.' These ornamental forks had doubtless been presented to the queen as foreign curiosities of some value, and were probably never used at table. As yet, and for a considerable time afterwards, forks were not in common use, a circumstance less attributable to ignorance of the invention, than to prejudice. So far was this prejudice carried, by even educated persons, that one divine preached against the use of forks, as being an insult to Providence not to touch one's meat with one's fingers!

Italy, as has been said, claims the merit of this useful invention. This fact is explicitly learned from an account of a tour in Italy by a traveller named Thomas Coryate, who visited that country in 1608. His travels, styled *Crudities*, were published first in 1611, and republished in 1776. In these *Crudities* appear the following passages respecting the Italian towns: 'I observed a custom in all those Italian cities and townes through which I passed, that is not used in any other country that I saw in my travels; neither do I think that any other nation of Christendom doth use it, but only Italy. The Italian and also most strangers do always at their meals use a little forke when they cut their meat. For while with their knife, which they hold in one hand, they cut the meate out of the dish, they fasten the forke, which they hold in their other hand, upon the same dish; so that whatsoever he be that sitting in the company of others at meals, should unadvisedly touch the dish of meat with his fingers, from which all the table doe cut, he will give occasion of offence unto the company, as having transgressed the laws of good manners, in so much that for his error he shall be at the least browbeaten, if not reprehended in wordes. This form of feeding, I understand, is generally used in all places of Italy; their forks being for the most part made of yron, steele, and some of silver, but these are used only by gentlemen. The reason for this curiosity is, because the Italian cannot by any means indure to have his dish touched with fingers, seeing that all men's fingers are not alike cleane. Hereupon, I myself thought good to imitate the Italian fashion by this forked cutting of meate, not only while I was in Italy, but also in Germany, and oftentimes in England since I came home; being once quipped for that frequent using of my forke, by a certain learned gentleman, a familiar friend of mine, Mr Laurence Whitaker, who in his merry humour, doubted not to call me at table *furcifer*, only for using a forke at feeding, but for no other cause.' The term here employed jocularly, was in its serious meaning one of reproach, having been applied by the Romans to those slaves who as a punishment bore a forked frame or yoke (*furca*), resembling an inverted Λ—hence the Italian *forca* and *forchetta;* the latter (little fork) being followed in the French term *fourchette*, while the former is the root of the English word fork.

Forks came so slowly into use in England, that they were employed only by the higher classes at the middle of the 17th century. About the period of the revolution, few noblemen had more than a dozen forks of silver, along with a few of iron or steel. At length, for general use, steel forks became an article of manufacture at Sheffield: at first, they had but two prongs, and it was only in later times that the three-pronged kind were made. As late as the early part of the 18th c., table-forks, and we may add knives, were kept on so meagre a scale by country inns in Scotland (and, perhaps, also in some parts of England), that it was customary for gentlemen in travelling to carry with them a portable knife and fork in a shagreen case; and till this day a small knife and fork form part of the ornamental equipment in the Highland dress. The general introduction of silver forks into Great Britain is quite recent; it can be dated no further back than the opening of the continent to English tourists at the termination of the French war in 1814. The extensive use of these costly instruments in the present day, marks in an extraordinary degree the rapid progress of wealth and refined taste throughout the United Kingdom.

FORLI, an interesting city of Italy, capital of the province of the same name, is beautifully situated at the foot of the Apennines, in a pleasant and fertile plain, on the right bank of the Montone, 16 miles south-west of Ravenna. It is a well-built, handsome city, is surrounded with walls, and contains many striking specimens of architecture, of which the Guerini Palazzo, built after the designs of Michael Angelo, the Palazzo Comunale, the Monte di Pietà, the cathedral, a majestic building, and the churches of S. Philipo Neri, of S. Girolamo, and of S. Mercuriale, are the most notable. The ecclesiastical buildings of F. contain some of the best pictures of Cignani, Carlo Maratti, Guido, and other masters. The citadel, founded in 1361, is now used as a prison. Pop. 18,043, who carry on silk-spinning and salt-refining, with a considerable trade in corn, linen, hemp, carthamus, woad, &c. F. (the ancient *Forum Livii*) is said to have been founded by Marcus Livius Salinator, after his victory over Hasdrubal, on the Metaurus, 207 B.C., and to have received its name from him. In the middle ages, it formed a republic, and exchanged its rulers frequently during the struggles of the Guelphs and Ghibellines. In 1503, it was annexed to the States of the Church, and so remained till 1860, when it was placed with the Æmilian provinces under the sceptre of Victor Emmanuel.

FORLO'RN-HOPE, the body of men selected to attempt a breach, or to lead in scaling the wall of a fortress. The name (which in the French, *enfants perdus*, is even more expressive) is given on account of the extreme danger to which the leaders of a storming-party are necessarily exposed. As, however, the honour of success is proportionate to the peril of the undertaking, there is ordinarily no lack of volunteers for this arduous service. The forlorn-hope is called by the Germans *Die verlornen Posten.*

FORMA PAU'PERIS, the phrase usually employed both in England and Scotland to signify the arrangements by which an action may be carried on by one who is too poor to sue in the ordinary way. In England, the statutes 11 Henry VII. c. 12, and 23 Henry VIII. c. 15, provide that such as will swear themselves not worth £5 except their wearing apparel and the matter in question in the cause, shall be exempt when plaintiffs, but not when defendants, from the payment of court-fees, and shall be entitled to have counsel and attorney assigned to them by the court without fee. They are further excused from costs when unsuccessful; a privilege which, according to Blackstone, amounted in former times only to the rather uncomfortable alternative of choosing between paying and being whipped. In the event of success, however, a person suing in this form is entitled to his costs, because his counsel and agent, and the officers of court, though they are bound to give their labour gratis to him, are not bound to give it on the same terms to his antagonist, unless he too be a pauper. To prevent the abuse of suing in the superior courts at Westminster in this form in matters of small amount, it is provided (19 and 20 Vict. c. 108, s. 30), subject to certain exceptions, that any plaintiff who resorts to one of these, in a case falling within the cognizance of a county court, and recovers no more than £20, or in some cases £5, shall have no costs, unless he satisfies the court or a judge that he had sufficient reason for taking that course. There are some other exceptions to the rule (see Stephen's *Com.* iii. p. 646).

In Scotland, this benevolent arrangement was introduced by statute more than half a century before the date of the English act we have mentioned. In 1424, the statute (c. 45), which we have already quoted under Advocate (q. v.), was passed for the purpose of securing professional assistance, gratis, to the poor, and for giving to them and those who assisted them their costs in the event of success. The more special arrangements applicable to litigation in this form in Scotland will be detailed under Poor's Roll (q. v.).

FORMATION, in Geology, is applied to a group of strata united by some character which they have in common, whether of age, origin, or composition, as the coal or chalk formation.

FO'RMEDON, an old form of action, in the Law of England, whereby an heir of entail or remainder man who had been ousted by a discontinuance, was entitled to vindicate his claim to the lands from which he had been ousted. By 21 James I. c. 16, it was enacted that writ of formedon should be brought within twenty years of the time when the cause of action arose. Writ of formedon is now abolished, together with other real actions.

FO'RMIC ACID (C_2HO_3,HO) derives its name from the circumstance of its having been first obtained from the *Formica rufa*, or red ant. In a concentrated state, it is a fuming liquor with an irritating odour, and occasions vesication if dropped upon the skin. It crystallises at a temperature below 32°, and boils at about 212°, yielding a vapour which burns with a blue flame. It is a strong reducing agent, at a boiling temperature reducing the salts of silver, mercury, platinum, and gold.

It may be obtained in various ways, as, for example: 1. By the distillation of red ants with water (a proceeding never adopted now). 2. By the distillation of a mixture of starch, binoxide of manganese, sulphuric acid, and water; this is the usual method, and various organic matters, as sugar, chaff, bran, saw-dust, &c., may be substituted for the starch. 3. By the distillation of oxalic acid mixed with sand, or far better (according to Berthelot), with glycerine; 1 equivalent of oxalic acid ($C_4O_6,2HO$) yielding 1 equivalent of formic acid (C_2HO_3,HO) + 2 equivalents of carbonic acid ($2CO_2$).

Berthelot has recently obtained it synthetically by keeping carbonic oxide gas for a prolonged period in contact with hydrate of potash, at a temperature of 212°. The gas becomes gradually absorbed, and formate of potash is the result, the reaction being exhibited by the formula, 1 equivalent of hydrate of potash (KO,HO) + 2 equivalents of carbonic oxide ($2CO$) = 1 equivalent of formate of potash (KO,C_2HO_3).

Formic acid is a very common product of the oxidation of organic bodies; thus, for example, the albuminates, glycine, sugar, starch, &c., yield it in association with other products, when acted on by chromic acid; the fats and fatty acids yield it when acted on by nitric acid; and it is a product of the action of ozone on glycerine, fats, fatty salts, acetic acid, and sugar, provided a free alkali is present. Hence, we can readily explain its occurrence as a product of oxidation in the animal organism, in which it not unfrequently occurs, either free or in combination. Thus we find it not only in ants, but in the poison of the bee and wasp, and in the hairs of the procession caterpillar. It has been detected by various chemists in the sweat, in the expressed juice of the spleen, pancreas, thymus gland, and muscles, in the brain, the blood, and the urine.

The salts of formic acid, which are termed by some chemists formates, and by others formiates, require no special notice. They are all soluble, and yield a red colour with persalts of iron.

FORMI'CA. See Ant.

FORMING'S ISLAND is a speck on the bosom of the Pacific, lying a little to the north of the Sandwich Group, or Hawaiian Archipelago, in lat. 30° 49′ N., and long. 159° 20′ W. It is one of the most recent additions to the British empire, having been formally occupied, mainly on account of its excellent harbour, towards the close of 1860.

FORMO'SA (Chinese name, *Tai-wan*), a large island on the south-east coast of China, opposite the province of Fu-keen, from which it is distant about 90 miles. It lies between 21° 53′—25° 16′ N. lat., and 120° 15′—122° 4′ E. long.; and for administrative purposes, is included in the province before mentioned, of which (together with Pang-hoo group) it forms a department. The length of F., from north to south, is about 237 miles, and its average breadth, from east to west, is about 70 miles. A chain of mountains running north and south nearly bisects the island, and divides it into an eastern and western province. Chinese settlers occupy the latter, but the other section is held by the aborigines. Tai-wan (q.v.), the capital, in 23° N. lat., and on the western coast, was opened to foreign commerce by the treaty of Tien-tsin, June 26, 1858. F. has a fertile soil, and produces rice, maize, sugar, tobacco, cinnamon, pepper, &c.; oranges, pine-apples, guavas, cocoa-nuts, pomegranates, as well as grapes, peaches, and other European fruits, are abundant. The aboriginal inhabitants are still in a very rude state.

FORMS OF ADDRESS. Many persons are exposed to inconvenience from their ignorance of the formal modes of addressing letters to persons of title; we shall therefore, in the present article, give an enumeration, taken mainly from Mr Dod's *Peerage and Baronage*, of the usual ceremonious modes of written address. Previous to their employment, the writer must, of course, learn either from the peerage-writers, or from some other source, the precise rank of the person whom he wishes to address, as well as the hereditary, personal, or official distinctions by which that rank is often modified.

1. *Archbishop*—Letters are addressed: 'His Grace, the Lord Archbishop of ——,' and commence: 'My Lord Archbishop.' More formal documents are addressed 'The Most Reverend Father in God (John Bird), by Divine Providence, Lord Archbishop

of Canterbury;' other archbishops and suffragan bishops being 'by Divine permission.' When personally referred to, an archbishop is styled 'Your Grace,' not 'Your Lordship.' The Archbishop of Armagh is addressed as 'His Grace the Lord Primate of Ireland.'

Archbishops' wives, and the other members of their families, enjoy no titles, as such.

2. *Baron*—Addressed: 'The Right Honourable Lord ——;' referred to as 'His Lordship,' or 'Your Lordship.'

Baron's Daughter—'The Honourable Mary ——;' or, if married, 'The Honourable Mrs ——.' Letters commence, 'Madam.'

Baron's Son—'The Honourable John ——.' Letters commence, 'Sir.'

Baron's Son's Wife—'The Honourable Mrs ——.' Letters commence, 'Madam.'

Baron's Wife, and *Baroness* in her own right—'The Right Honourable Lady ——;' in strictness, but more commonly, 'The Lady ——.' Letters commence, 'Madam,' and refer to her as 'Your Ladyship.'

Baronet—'Sir John ——, Bart.' Letters commence, 'Sir.'

Baronet's Wife—'Lady ——.' Unless she has a title as the daughter of a peer, no Christian name is used. She is referred to as 'Your Ladyship.'

Bishop—'The Right Reverend the Lord Bishop of ——.' Letters commence, 'My Lord.' Frequently the address is simply, 'The Lord Bishop of ——.' The style in formal documents is, 'The Right Reverend Father in God (John ——), by Divine permission, Lord Bishop of ——.' Scotch bishops are addressed 'The Bishop of ——,' sometimes as 'The Right Reverend Bishop (e. g., C. H. Terrot)', and letters commence, 'Right Reverend Sir.' The colonial bishops are addressed by their territorial titles, like those of England.

Bishops' Wives and Children have no titles.

Countess—'The Right Honourable the Countess of ——.' Letters commence, 'Madam,' and refer to her as 'Your Ladyship.'

Duchess—'Her Grace the Duchess of ——.' Letters commence, 'Madam,' and refer to her as 'Your Grace.'

Duke—'His Grace the Duke of ——.' Letters commence, 'My Lord Duke;' and he is referred to as 'Your Grace.'

Duke's Daughter—'The Right Honourable Lady Mary ——,' or less formally, 'The Lady Mary ——.' Letters commence, 'Madam,' and refer to her as 'Your Ladyship.' If she is married to a person of inferior rank, her surname only is changed.

Duke's Eldest Son—Uses the second or some other title of his family by courtesy, and he is addressed as if he held the title by law, though in formal documents he is called '——, Esq., *commonly called* the Marquis or Earl' (as the case may be).

Duke's Younger Son—'The Right Honourable Lord John Russell,' or less formally, 'The Lord John R——.' 'My Lord,' and 'Your Lordship.'

Duke's Younger Son's Wife—'The Lady John ——,' unless where she has a title in her own right. 'Madam,' and 'Your Ladyship.'

Earl—'The Right Honourable the Earl of ——,' or less formally, 'The Earl of ——.' 'My Lord,' and 'Your Lordship.'

Earl's Daughter—Like Duke's Daughter (q. v.).

Earl's Eldest Son is addressed as if the title which he holds in courtesy were a title in law.

Earl's Younger Son—Like Baron's Son (q. v.).

Earl's Younger Son's Wife—Like Baron's son's wife, unless of superior rank to her husband.

Earl's Wife. See *Countess.*

King—'The King's Most Excellent Majesty.' 'Sire,' and 'Your Majesty;' or, in less formal notes, thus: 'Mr Pill presents his duty to your Majesty.'

Knight Bachelor—Like Baronet (q. v.), except that the word 'Bart.' is omitted.

Knight Bachelor's Wife—Like Baronet's Wife (q. v.).

Knight of the Garter—K.G. is added to the name or other title of the bearer.

Knight of St Patrick—K.P. used in the same manner.

Knight of the Thistle—K.T.

Knight of the Bath—if a Knight Grand Cross, K.G.C.B.; if a Knight Commander, K.C.B.

Knight of the Bath's Wife—Like the wife of a Baronet or Knight Bachelor.

Lord Advocate (*of Scotland*)—'The Right Honourable the Lord Advocate' by courtesy; but in official documents he is styled 'Her Majesty's Advocate for Scotland.' Letters ought strictly to commence, 'Sir,' not 'My Lord,' though the latter mode of address is the more usual.

Lord Lieutenant (*of Ireland*)—'His Excellency the Lord Lieutenant;' and letters commence in accordance with his rank in the peerage or otherwise. If a duke, he is styled 'His Grace the Lord Lieutenant.'

Lord Mayor—'The Right Honourable the Lord Mayor.' 'My Lord,' and 'Your Lordship.' There are only three Lord Mayors—those of London, York, and Dublin.

Lord Provost—The Provost of Edinburgh is 'The Right Honourable the Lord Provost;' of Glasgow, 'The Honourable the Lord Provost;' of Perth, 'The Lord Provost.' There are no other Lord Provosts. Perhaps the distinction in the title of the chief magistrate of the Scottish capital is traceable to his having been always a member of the Privy Council of Scotland, from at least the period of the Revolution.

Lord of Session (in Scotland)—'The Honourable Lord ——.' 'My Lord,' and 'Your Lordship.'

Lords of Her Majesty's Treasury—These in their collective capacity are addressed as 'The Honourable the Lords Commissioners of Her Majesty's Treasury;' individually they have no title from their connection with the Treasury.

Maid of Honour—'The Honourable Miss;' and 'Madam.'

Marchioness—'The Most Honourable the Marchioness of ——.' 'Madam,' and 'Your Ladyship.'

Marquis—'The Most Honourable the Marquis of ——,' *not* 'The Most Noble.' Letters commence 'My Lord Marquis;' but when personally addressed, he is styled 'My Lord,' and 'Your Lordship.'

Marquis's Daughter—Like Duke's Daughter (q. v.).

Marquis's Eldest Son—Like Duke's Eldest Son (q. v.).

Marquis's Younger Son, like Duke's Younger Son (q. v.).

Mayors—In formal documents, 'The Right Worshipful the Mayor ——;' but in letters, simply 'The Mayor.'

Members of Parliament—The letters M.P. are added to their usual address.

Officers in the Navy and Army—Their rank in the service is always prefixed to any other title they may possess, thus: 'Captain the Lord John ——.'

Prince—'His Royal Highness Prince ——;' or 'His Royal Highness the Duke of ——,' when the Prince is also a Duke. In practice, the initials H.R.H. are usually substituted for the words. A letter begins 'Sir,' not 'My Lord Duke;' and the mode of reference is 'Your Royal Highness.'

Princess—'Her Royal Highness the Princess ——,' or 'The Duchess' (as the case may be). 'Madam,' and 'Your Royal Highness.'

Prince's Wife, though of inferior rank, like a Princess by birth.

Privy Councillor—'The Right Honourable John ——.'

Privy Councillor's Wife and Children have no title.

QUEEN—'The Queen's Most Excellent Majesty.' 'Madam,' and 'Your Majesty;' or, 'The Lord John R—— presents his duty to your Majesty.'

Viscount—'The Right Honourable Lord Viscount ——,' or less formally, 'The Lord Viscount.' 'My Lord,' and 'Your Lordship.'

Viscountess—'The Right Honourable the Viscountess,' or less formally, 'The Viscountess.' 'Madam,' and 'Your Ladyship.'

Viscount's Daughter, like Baron's Daughter (q. v.).

Viscount's Son, like Baron's Son (q. v.).

Viscount's Son's Wife, like Baron's Son's Wife (q. v.).

The formality of these modes of address experiences considerable modifications when employed by persons of equal rank. Between friends and relatives, they are either entirely dispensed with (except, of course, in addressing letters), or adapted to the feelings and caprices of the writers. In this, as in many other respects, we of the present generation are far less ceremonious than our fathers, and still more than our grandfathers were. In most old letters, it will be found that the titles of the writers are preserved even where there is the freest and most familiar interchange of thought and feeling. Wives address their husbands, and husbands their wives, children their parents, and occasionally even parents their children, as 'Sir' or 'Madam,' 'My Lord,' or 'Your Royal Highness,' as the case may be.

FORMS OF PROCEDURE. See PROCESS.

FORNICA'TION (*fornicatio*, from *fornix*, an arch-vault, and by metonymy, a brothel, because brothels at Rome were in cellars and vaults under ground). In most countries, this crime has been brought within the pale of positive law at some period of their history, and prohibited by the imposition of penalties more or less severe; but it has always been found ultimately to be more expedient to trust to the restraints which public opinion impose on it in every community which is guided by the principles of morality and religion. In England, in 1650, during the ascendency of the Puritan party, the repeated act of keeping a brothel or committing fornication was made felony without benefit of clergy on a second conviction. At the Restoration, when the crime of hypocrisy seemed for a time to be the only one which, under the influences of a very natural reaction, men were willing to recognise, this enactment was not renewed; and though notorious and open lewdness, when carried to the extent of exciting public scandal, continued, as it had been before, an indictable offence at common law, the mere act of fornication itself was abandoned 'to the feeble coercion of the spiritual court, according to the rules of the canon law, a law which has treated the offence of incontinence with a great deal of tenderness and lenity, owing perhaps to the constrained celibacy of its first compilers.'—*Blackstone.* The proceedings of the spiritual court were regulated by 27 Geo. III. c. 44, which enacts that the suit must be instituted within eight months, and that it cannot be maintained at all after the marriage of the parties offending. But proceedings in the ecclesiastical courts for this offence have now fallen into entire desuetude (Stephen's *Com.* iv. 347). In Scotland, shortly after the Reformation, fornication was prohibited by what Baron Hume calls 'an anxious statute of James VI' (1567 c. 13), entitled 'Anent the Filthie Vice of Fornication, and Punishment of the samin.' This act, which was passed in the same parliament by which incest and adultery are punished with death, provides that the offender, whether male or female, shall pay for the first offence a fine of £40 Scots, and shall stand bareheaded, and fastened at the market-place, for the space of two hours; for the second, shall pay a fine of 100 merks, have the head shaven, and shall be exposed in the same public manner; and for the third, pay a fine of £100, be thrice ducked in the foulest pool of the parish, and be banished the town or parish for ever. There is but one instance of this statute having been enforced by the Court of Justiciary, which occurs, as might be supposed, during the government of the Protector in Scotland. The offence of keeping a house of notorious ill-fame and scandalising the neighbourhood, is punishable in Scotland as a police offence. See NUISANCE, MORAL, and PROSTITUTION.

FORRES, a royal burgh in the county of Elgin or Moray, situated on a well-marked old sea-terrace and promontory, distant about two miles from the mouth of the river Findhorn (q. v.). Pop. (1861) 3508. It was a royal burgh in the reign of King David I. (1124—1153), and was subsequently the seat of the Archdeacon of Moray, who had as his prebend the church of Forres, dedicated to St Laurence the martyr, and the church of Logynfythenach (now Edinkillie), dedicated to St John the Baptist. A painting of St Laurence holding in his hand the gridiron on which he is said to have been roasted, is preserved at Brodie House near Forres. The antiquities of the place are the remains of its castle, at the west end of the town, now surmounted by a monument, erected to the memory of Dr Thomson (a native of Cromarty, distinguished by his eminent medical services in the Crimean war), and the remarkable sculptured pillar—25 feet high—sometimes called Sueno's Stone, but more commonly 'the Stan'in' Stane,' which stands about a mile to the eastward. A monastery of black friars is said to have stood formerly on the site now occupied by Anderson's or the Forres Academical Institution. F. lies at the foot of a curiously formed group of four gravelly hills, named the Cluny or Cleeny Hills, evidently water-made, on the highest of which, the site of an old encampment, an octagonal tower 66 feet high, was erected to the memory of Nelson in 1806.

FORSTER, JOHN, an English political and historical writer, was born at Newcastle in 1812. He was educated for the bar, but early, like so many other law-students, devoted himself to periodical writing. In this sphere of literature he displayed more than usual ability; and his political articles in the London *Examiner*, for which he commenced writing in 1834, attracted more attention than is usually bestowed on newspaper leaders. There was a vigour and point about them, coupled with a truth, consistency, and outspoken honesty (the three latter qualities being more rare in newspaper writers a quarter of a century ago than they are now), which obtained a wide renown for the paper. F. became editor of the *Examiner* in 1846, an office which he still discharges. He is the author of many admirable biographical and historical essays, and we are indebted to him for much new and valuable information tending to elucidate obscure points, and correct erroneous notions about the times and statesmen of the English Commonwealth. It is to this period of history that F. has chiefly directed his studies, and no person desirous of properly understanding it, should neglect his *History of the Grand Remonstrance*, *Arrest of the Five Members*, and *Lives of the Statesmen of the*

Commonwealth. His literary memoirs are also excellent, and his most elaborate effort in this way, *The Life and Times of Oliver Goldsmith*, is a charming piece of biography. F.'s style is clear, forcible, and elegant. He was appointed Secretary to the Commissioners in Lunacy in 1856; and in 1861, a Commissioner in Lunacy.

FORSTER, Johann Reinhold, a German traveller and naturalist, was born in Dirschau, in Prussia, in 1729, and died at Halle in 1798. He was educated at Halle and Danzig for the clerical profession, and in 1753 became pastor at Nassenhuben, near Danzig; but he seems to have devoted most of his time to the study of mathematics, natural philosophy, natural history, and geography. In 1765, he accepted an offer made to him by the Russian government, to inspect and report upon the new colonies founded on the banks of the Volga; and the matter of his report is said to have been so good as to have given to the Empress Catharine suggestions for her great code of laws. His irritable temper soon involved him in difficulties with the Russian government; and in the following year he repaired to England, where the exertions of some of his scientific friends in London soon procured for him the office of teacher of natural history, and of the French and German languages, at an educational institution for dissenting clergymen at Warrington, in Lancashire. He retained this post until 1772, when he received, through the influence of Mr Banks, the offer of naturalist to Captain Cook's second expedition to the South Seas. In the course of the voyage, his temper seems to have frequently brought him into unpleasant collision with the other officers; and after the return of Captain Cook's vessels in July 1774, a controversy arose between F. and Lord Sandwich on the question as to who should write the narrative of the voyage. It was finally settled that F. should write the philosophical, and Cook the nautical parts of the work; but further difficulties arose, and Cook's journal appeared alone. In 1776, in association with his son, he published a work (in Latin) on the botany of the expedition; and in 1778 his *Observations faites dans un Voyage autour du Monde sur la Géographie Physique, l'Histoire Naturelle, et la Philosophie Morale* appeared. In the latter year, he returned to Germany, and was soon afterwards made Professor of Natural History and Mineralogy at Halle, where he remained until his death. In addition to the works mentioned, he published *De Bysso Antiquorum*, 1775; *Zoologia Indica*, 1781; *Geschichte der Entdeckungen und Schiffahrten im Norden*, 1784 (translated into English and French), &c.

FORSTER, Johann Georg Adam, commonly known as George F., eldest son of Johann Reinhold Forster (q. v.), a German traveller and naturalist, was born at Nassenhuben, near Danzig, in 1754, and died at Paris in 1794. When only 17 years of age, he accompanied his father in Captain Cook's second voyage; and shortly after his return, he published, with the assistance of his father, an account of the expedition. His book, which does not differ materially in its facts from Cook's narrative, was well received by the public, and was translated into French, German, Swedish, and other languages. Humboldt speaks of this work and of its author, 'my celebrated teacher and friend, George Forster,' in the highest terms in the *Cosmos* (see vol. ii. p. 437, Bohn's ed.). F. having returned to the continent, was made Professor of Natural History at Cassel, and afterwards at Wilna. Having there no access to books, in 1788 he gladly accepted the office of librarian to the Elector of Mayence. After Mayence was taken by the French in 1792, F., who had become an ardent republican, was sent as a deputy to Paris, to request the incorporation of Mayence with the French republic. While he was in Paris on this mission, the Prussians retook Mayence, and F. lost all his property, including his books and manuscripts. He then writes to a friend: 'If I could only scrape together £400, I would learn Persian and Arabic, and go overland to India to gather new experience;' but about this time he seems to have been suffering from rheumatic gout, which gradually increased in severity, and which terminated his life on the 12th of January 1794. Besides numerous translations, and the account of Captain Cook's voyage, his most important works are *Kleine Schriften, ein Beitrag zur Ländes- und Völkerkunde, Naturgeschichte und Philosophie des Leben* (6 vols., Berlin, 1789—1797), and *Ansichten vom Niederrhein, vom Brabant, Flandern, Holland, England, und Frankreich* (3 vols., Berlin, 1791—1794). His widow, the daughter of Heine, but perhaps more widely known as Therese Huber, published a collection of his Letters, in 2 vols., in 1828—1829; and a complete edition of his works, in 9 vols., was published by his daughter and Gervinus, in 1843.

FORSTER, Thomas Ignatius Maria, an English meteorologist and physicist, born in London in 1789, and died in 1850. In 1812, he entered the university of Cambridge; in the following year, he produced an annotated edition of Aratus, and in 1816 he edited an edition of Catullus. In 1817, he published *Observations on the Influence of Particular States of the Atmosphere on Human Health and Diseases;* in 1824, *The Perennial Calendar;* in 1827, *The Pocket Encyclopædia of Natural Phenomena*, a work which has elicited the commendation of Quetelet and Humboldt; in 1836, *Observations sur l'Influence des Comètes;* and in 1850, *Annales d'un Physicien Voyageur.* A work entitled *Epistolarium Forsterianum*, consisting of a collection of original letters from eminent men, preserved in the Forster family, was published after his death, at Brussels, in 1852.

FORT, a term of peculiar meaning in British North America, applied to a trading-post in the wilderness with reference to its indispensable defences, however slight, against the surrounding barbarism. It has thus been often employed to designate merely a palisaded log-hut, the central oasis of civilisation in a desert larger, it may be, than Scotland.

FORT, FORTRESS (from Lat. *fortis*, strong), a stronghold, made secure by walls, and generally further protected by a ditch and parapet. For the construction of forts, see Fortification.

FORT ADJUTANT, an officer holding an appointment in a fortress—where the garrison is often composed of drafts from different corps—analogous to that of adjutant in a regiment. He is responsible to the commandant for the internal discipline, and the appropriation of the necessary duties to particular corps. Fort adjutants, of whom there are at present (1862) ten, are staff-officers, and receive 4*s.* 9*d.* a day in addition to their regimental pay.

FORT AUGUSTUS, a village at the south end of Loch Ness, 29 miles south-west of Inverness. A fort, intended to overawe the Highlands, was built here soon after the rebellion of 1715, on a small eminence on the loch. It can accommodate 300 men, but is commanded by neighbouring heights. It was taken by the rebels in 1745, and became the head-quarters of the Duke of Cumberland after the battle of Culloden. It is a quadrangle, with a bastion at each of the four corners. The twelve six-pounders formerly mounted here have been removed, but a few soldiers are generally stationed at the fort.

FORT GEORGE, a fortification in the north-east of Inverness-shire, on a low sandy projection into the Moray Firth, here only one mile broad, opposite Fortrose, and nine miles north-east of Inverness. It is the most complete fort in the kingdom, and was built, at a cost of £160,000, soon after the rebellion of 1745, to keep the Highlanders in subjection. It covers twelve acres, and can accommodate 2000 men. It is an irregular polygon, with six bastions, and upwards of 70 guns. It is defended by a ditch, covert-way, a glacis, two lunettes, and a ravelin. It has casemated curtains, 27 bomb-proof rooms, bomb-proof magazines, and is supplied with water from eight pump-wells. It is, however, only secure from attack by sea.

FORT GEORGE (INDIA). See MADRAS.

FORT MAJOR, the next officer to the governor or commandant in a fortress. He is expected to understand the theory of its defences and works, and is responsible that the walls are at all times duly protected. He is on the staff, and receives 9*s.* 6*d.* a day in addition to his half-pay.

FORT ROYAL, a fortified seaport of the French island of Martinique, in the West Indies, is the capital of the colony. It stands on the west coast, in a bay of its own name, in lat. 14° 35′ N., and long. 61° 4′ W. It has a population of about 12,000, and contains offices for the local government, barracks, arsenal, and hospital.

FORT ST DAVID, on the Coromandel or east coast of Hindustan, belongs to the district of South Arcot and presidency of Madras. It is three miles to the north of Cuddalore, and 100 to the south of Madras, in lat. 11° 45′ N., and long. 79° 50′ E. The place became British in 1691. It occupied a prominent position in the great struggle for supremacy between England and France. From 1746 to 1758, it was the capital of the settlements of the former power on the Carnatic; but soon afterwards, its fortifications having been demolished, it sank into comparative insignificance.

FORT WILLIAM, a village in Inverness-shire, near the west base of Ben Nevis, 63 miles south-west of Inverness, and at the south end of the Caledonian Canal. A fort was originally built here by General Monk, and afterwards rebuilt on a smaller scale by William III. It is an irregular work, with ditch, glacis, ravelin, bomb-proof magazine, and barracks for 100 men. It resisted sieges by the Highlanders in 1715 and 1745. It was one of the old keys to the West Highlands, and is now only inferior to Oban as a centre for tourists to explore these romantic regions.

FORT WILLIAM (INDIA). See CALCUTTA.

FORTÉ, in Music, the Italian term for loud; *fortissimo*, as loud as possible.

FORTESCUE, SIR JOHN, an eminent judge and writer on English law, descended from a Devonshire family, was the son of Sir Henry Fortescue, Lord Chief-justice of Ireland, and was born some time in the reign of Henry IV. Educated at Exeter College, Oxford, he was called to the bar at Lincoln's Inn, and in 1441 was made serjeant-at-law. The following year, he was appointed Lord Chief-justice of the Court of King's Bench. In the struggle for the crown between the Houses of York and Lancaster, he steadily adhered to the latter, and is supposed to have been for a time Lord High Chancellor of England. Lord Campbell, in his *Lives of the Lord Chancellors* (vol. i. p. 367), under date February 17, 1461, says: 'If Sir John Fortescue ever was *de facto* chancellor, and in the exercise of the duties of the office, it must have been now, after the second battle of St Albans, and at the very conclusion of the reign of Henry VI.' In March of that year, he fought at the battle of Towton for that monarch, and was attainted by the parliament under Edward IV. He accompanied the queen, Margaret of Anjou, and her young son, Prince Edward, on their flight into Scotland, and while there wrote a treatise in support of the claim of the House of Lancaster to the English crown. In 1463, he embarked with the queen and her son for Holland, where he remained for several years, intrusted with the education of the young prince. During his exile, he wrote his celebrated work, *De Laudibus Legum Angliæ*, for the instruction of his royal pupil. In the introduction, and throughout the dialogue, he designates himself 'Cancellarius.' It was when he was in Scotland that the title of Chancellor of England is said by some to have been conferred upon him by the dethroned monarch. He probably had the titular office of chancellor *in partibus* during his exile, but never exercised the functions in England. In 1471, he returned with Queen Margaret and her son; but on the final defeat of the Lancastrian party at the battle of Tewkesbury, where he is said to have been taken prisoner, finding that parliament and the nation had recognised the title of Edward IV., he submitted to that monarch, and, as a condition of his pardon, wrote a treatise in favour of the claim of the House of York. He was allowed to retire to his seat of Ebrington, in Gloucestershire, where he died in his 90th year. His male representative was, in 1789, created Earl Fortescue and Viscount Ebrington in the peerage of Great Britain.

FORTH, a river of Scotland, rises in the north-west of Stirlingshire, in the mountains between Loch Katrine and Loch Lomond, from two main branches, the Duchray, 16 miles long, from the east side of Ben Lomond, and the Avendhu, 12 miles long, flowing through Lochs Chon, Dhu, and Ard. These streams unite at Aberfoyle, and issue from the mountains. The F. then runs east and south-east along the borders of Perth and Stirling shires, with numerous windings, in a wide valley abounding in picturesque scenery. It passes Stirling, and a little above Alloa it widens out into the Firth of Forth. The F. is only 30 miles long in a straight line from its source to the mouth of the Devon; but, owing to its sinuosities, its real course is more than twice that length. It is navigable for vessels of 100 tons to Stirling. Its chief tributaries are the Teith, the Allan, and the Devon. The upper parts of the F. and Teith traverse some of the most romantic lake and mountain scenery in Scotland.

FORTH, FIRTH OF, an arm of the sea, or the estuary of the river Forth, lies between the counties of Clackmannan, Perth, and Fife on the north, and those of Stirling, Linlithgow, Edinburgh, and Haddington on the south. It first extends 6 miles south-east from where the Devon joins the Forth; then, with an average breadth of 2¼ miles, it runs 10 miles to Queensferry; and finally, it extends 36 miles north-east, gradually expanding in width to 15 miles between Fife-ness and Tantallon Castle on the coast of Haddingtonshire. Its waters are from 7 to 30 fathoms deep, and encircle the Isle of May, Bass Rock, Inchkeith, Inchcolm, Cramond Isle, &c. On the coast, are many fine harbours. St Margaret's Hope, above Queensferry, is one of the safest roadsteads in the kingdom. The chief rivers which fall into the firth are the Forth, Carron, Avon, Almond, Esk, and Leven. The counties along its shore are the most fertile and best cultivated in Scotland, and include the maritime towns of North Berwick, Musselburgh, Portobello, Leith, Queensferry, Grangemouth, Culross, Burntisland, Kirkcaldy, &c.

FORTHCOMING, in the Law of Scotland, is an action by which an arrestment is made available to the arrester. The arrestment secures the goods or debts in the hands of the creditor or holder; by the forthcoming the arrestee and common debtor are called before the judge to hear sentence given, ordering the debt to be paid, or the effects to be delivered up to the arresting creditor. (Bell's *Law Dictionary.*)

FORTIFICATION, a term derived through the Italian from the Latin *fortis* and *facere*, means literally the 'making strong' of any place whatever, be it a town, an arsenal, a camp, a mere house, or the extended position of an army occupying a tract of country, a province, or even a kingdom. In effect, the term is limited to strengthening by means of walls, ditches, or other stationary obstructions, aided more or less by artillery, which may impede hostile advance.

Fortification cannot pretend to render strongholds impregnable, for no works, however skilfully devised, will withstand the continued fire of well-directed artillery, backed by energy and discretion on the part of assailants: its aim is to enable a beleaguered garrison to hold out, without losing ground, until it can be relieved by the advance of allies operating in the field. In fortifying a place, the engineer usually proceeds upon some defined system of entourage; but if he hope for success, his science must be sufficiently elastic to adapt itself to all the natural features of the locality; and from this it follows that a system perfect in theory, and of universal application, will in practice have to undergo modifications, differing in almost every instance.

The origin of the art is involved in an obscurity which history need not hope to penetrate. The earliest records of all nations speak of walled cities and forts.

The prime element of all fortification is the parapet (from Italian *para*, before; *petto*, the breast), which may be a wooden stockade, a wall of masonry, or a mound of earth, and is intended to give more or less cover to the defender from the projectiles of his adversary, while he is still able to use his own weapons against the latter. The simplest form of parapet being the mound of earth, the ground adjoining it would probably be dug up for its formation, and from this would almost unconsciously ensue the ditch, as an additional means of separating the assailant and the assailed. Starting, then, from this parapet and ditch or fosse, as the elementary forms of defence, it will be well, before proceeding to describe the ancient and modern systems, to give concise practical definitions of the parts, adjuncts, and technical names of a fortification.

The first duty of a defender is to prevent, as far as possible, the enemy's near approach to any of his works. In developed systems, this is sought to be done by bastions, &c. (of which hereafter), which stand out at angles to the general line, so as to afford a fire commanding all parts. But as cases occasionally happen of troops, defended by a mere straight parapet and ditch, having to withstand the advance of the enemy, it is necessary to adopt every measure which can obstruct his path, harass his advance, and, if possible, aid in cutting off his retreat in the event of failure.

Abattis (q. v.) are among the simplest obstacles to be improvised, consisting of trees cut down, shorn of their leaves and smaller twigs, having their branches pointed, and then laid close together, in one or more lines parallel to the works, branches outward, and trunks imbedded or pinned down in the earth. Accoutred troops must remove these before they can pass, and the operation of removal under fire from the besieged is a very serious one indeed.

Chevaux-de-frise (q. v. for derivation and illustration) are pointed iron or wooden rods fixed crosswise in a wooden beam, and until removed offering a complete obstacle to progress. They are very useful in a breach or other unclosed portion of a work, and are now made in pieces, so as to be portable, and yet ready for immediate putting together. A cheval-de-frise is usually 12 feet long, with a beam 9 inches square.

Chausse-trapes, or *Caltrops* (q. v.), give serious annoyance to troops advancing, and are especially dangerous in cases of night-attack. Their use was, however, more general formerly than it is now.

Trous-de-loup (wolf-traps), which are deep holes dug, and armed at the bottom with spikes, young trees cut down and their stumps pointed, inverted harrows, broken sword-blades, bayonets, or any similar annoyances, are resorted to as expedients to gain time, and thereby insure a more deadly fire on the assailants. They are frequently constructed in the glacis of a work.

Fraises and Stockades represent another form of additional defence, and are stout posts driven horizontally or perpendicularly into the earth, in long close rows. Fig. 1 shews the use of both these defences in the ditch of a fortress, and it will be perceived at once how formidable to an attacking party solid lines of these posts must be. The stockade forms likewise, at times, a good substitute for the parapet itself, particularly when the direct fire of artillery is unlikely to be brought against it, as in warfare with barbarous tribes, or in a work at the very crest of a steep hill. In this case it is usually constructed of two rows of strong palisades firmly imbedded in the ground: the outer nearly a foot square, planted with three-inch intervals between; the second about six inches in diameter, closing these spaces behind. Every second small palisade is cut short a few inches, so as to leave a loophole for musketry-fire (as in fig. 2). A hill protected in this manner is shewn in fig. 3.

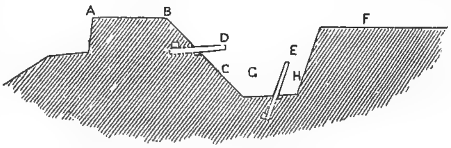


Fig. 1.—Fraise and Stockade (in section): AB, parapet; C, escarp; D, fraise; E, stockade; F, glacis; G, ditch; H, counterscarp.

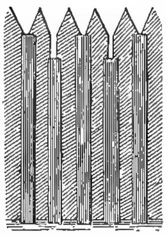


Fig. 2.—Stockade.

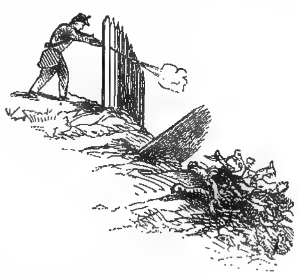


Fig. 3.—Double Stockade.

Construction of the Parapet.—The object of the parapet being to defend, or *defilade* a certain portion of ground behind it, its height must be calculated so that missiles passing across its crest shall fail to strike the troops mustered behind. The minimum width defiladed to allow of safe communication for troops behind, and actually defending, is 30 feet; but if the men have to be drawn up in line, not less than 90 feet will suffice. The mode of ascertaining the height of parapet necessary in particular cases will be seen from the next diagram (fig. 4). Let A be the position at which the parapet is to be made, and AB the space which

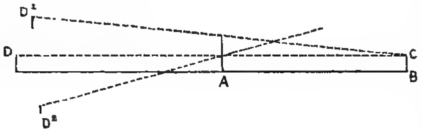


Fig. 4.

it is required to defilade to a height throughout equal to BC. D, D_1, D_2, are three points, according to the supposed country round, from which fire could be had at the parapet—one, D, being on the level, the others on ground respectively higher and lower than the parapet: if lines be now drawn from these points to C, their intersection with a perpendicular, raised on the point A, will shew the elevation necessary for the parapet protecting the space AB to the height BC. From this, the disadvantage will be apparent of constructing a parapet within range of higher ground, as for every extra foot of elevation in the commanding rise a proportionate addition must be made to the height of the parapet. In practice, the ordinary parapet for a level is eight feet high, which allows for the depressed trajectory of a spending ball. See Projectiles. If the parapet be raised on ground above the attacking position, it may be lowered, according to the angle, to about six feet six inches, the height necessary for a man standing up to be thoroughly protected. On the other hand, if the position, A, be lower than the point occupied by the assailant, the parapet must be raised; as 12 feet forms the limit to which a parapet can conveniently be thrown up, further height necessary for protection is obtained by sinking the ground to be defiladed before the parapet's base. In measuring for these heights, the instruments used are *boning-rods*, which are fixed in the ground at D and B, with the normal height of a man marked on them; a third rod at A is then marked at the point where the line of sight between the normal points on the two others intersects it, and so shews the height of the parapet.

The foregoing parapet has been provided only as a straight breastwork, deriving its safety solely from its own fire in a direct line upon the besiegers; but in practice such a rampart would be exposed to the disadvantage of holding but little command over the *scarp* or *escarp* (part cut away) at its foot; so that, if approached under cover, an enemy could readily lodge himself therein. To guard against this a work is *flanked*, so that the fire of one part shall take in flank an enemy advancing against another part. See fig. 5, where ABCDE is a flanked or reciprocally defensive parapet, in which it is evident that the fire from AB, DE, must take in flank any force moving on BC or CD, while the latter also, in like manner, flank AB, DE, themselves. In a flanked defence of this sort, the angles, A, C, E, which project towards the country, are technically termed *salient angles;* those at B and D, *re-entering angles.* The flanked parapet has often, likewise, the power of defilading larger spaces than the simple line of parapet, since the salient angles can, perhaps, be brought on elevated ground; while the re-entering angles, though with less elevation, may in some degree compensate that defect by greater distance from the front. A disadvantage of flanked defences is, that the hostile fire crosses the parapet at a less angle than in the straight line, and may, therefore, be more deadly; indeed, the object of the assailant will always be to obtain an enfilade fire *along* one or more parapets of the defence, as (in fig. 5) an enemy posted at F, would be able to sweep the complete line of the parapet CB. To avoid this, the engineer who constructs the works must ascertain minutely the elevation of the surrounding points, and make his salients at such angles that the prolongation of his parapets towards the enemy shall always fall on low ground, whence no command can be obtained.

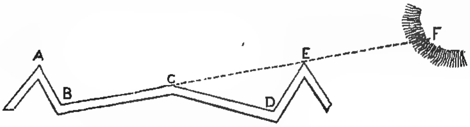


Fig. 5.

Now, where the salient angle becomes somewhat acute, and there is an enemy on both fronts, the soldiers defending the right parapet, and standing on its banquette, would be exposed to a *reverse* or back fire from the enemy in front of the left parapet, beyond the defilading of which they would doubtless be. As a remedy, an internal parapet, called a *traverse*, or, from its duty, a *parados*, is raised between the parapets of the salient, its height being determined on precisely the same principles as were made use of in regard to the original parapets.

Where both the faces of the salient are unavoidably so placed as to be enfiladed, a small work, called a *bonnet*, is constructed at the angle, which consists in the parapet being so raised up to an extra height of twelve feet if necessary, and at the same time widened, that the banquette shall be defiladed. If a height of twelve feet is insufficient to defilade the whole length of the banquette, traversing parapets must be raised at right angles to the face of the work, and within it, at such distances that the whole may be safe: of course, the height of the bonnet and of the traverses must be decided on rules analogous to those explained in fig. 4. The increased height of the parapet of the bonnet renders it necessary to have two or more banquettes at that portion of the work, with steps to aid the ascent (see section in fig. 6); as AB, the crest of the general parapet, with banquette at C; and DE, the bonnet, with banquettes at F and G.

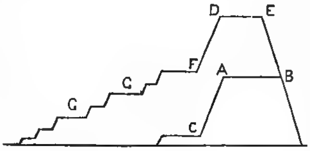


Fig. 6.—Bonnet.

In enclosed works—i. e., in works entirely surrounded by parapets—the position of the parados is of vital importance; and they have often to be devised with great ingenuity, so as to protect the defenders from reverse fire in any direction, and at the same time not to prevent necessary communication between different portions of the fortress.

Relief means the height of any point in a work above the plane of construction, which may be the line of sight or the bottom of the ditch. In the latter case, the relief of the parapet is an important item in estimating the resisting power of a work, as it represents the vertical equivalent of the obstacle which will be offered to a foe.

When the relief of the parapet's crest has been determined, its thickness becomes the next consideration. The dimensions are laid down on the ground, and depend, first, on the angle at which the material to be used will pile; and then, on the nature of the missiles against which the parapet is to afford protection. For example, an earthwork of from three to four feet suffices to resist musketry; a thickness of 18 feet is impervious to the 24-pounder; while larger guns can pound through even more solid obstructions.

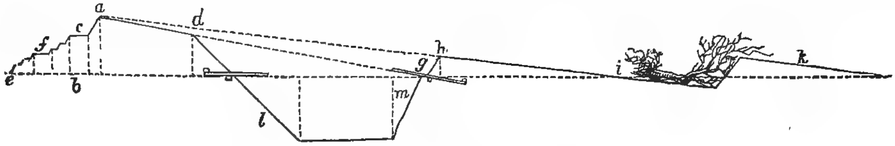


Fig. 7.—Section of Parapet, Ditch, and Glacis.

Taking fig. 7 as an example, in which *a* is the crest of the parapet, then the banquette *c* should, for convenient firing, be four feet three inches below *a*; its width three feet, if for a single line of soldiers; four feet six inches for a double rank; its slope should be one in twelve, that water may run freely off. The base, *be*, of the slope, up which the men mount to the banquette, should be twice its height *bc*, and cut into steps with inclined sides, to allow of easy ascent; and where the height is considerable, a supplemental banquette (on which relieving-men can, if necessary, reload), is desirable. The interior slope, *ac*, of the parapet should be one in four; the exterior slope, or *plongée*, *ad*, intended for the direction of the guns on an assailant, one in six, a deviation being permitted between one in nine and one in four; but the crest being more liable to destruction as the slope of *ab* is augmented, it is best to keep it as small as circumstances will allow; one in six is the ordinary slope in English fortification, the angle of the interior slope being constant. In some continental services, however, the angle, *cad*, is kept constant at 100°, by increasing the deviation of the interior slope of the parapet from the perpendicular as the plunge of the exterior is greater. The flatter, however, the crest of the parapet is the better, as sand-bags are in certain cases ranged on it to form cover for the men, while they fire through loopholes left in this additional defence. Earth of medium tenacity maintains its position properly when sloped at an angle of 45°; and this is the greatest angle which can be counted on for the outer slope of the parapet. The scarp, *l*, and counterscarp, *m*, of the ditch need not have so great an incline, as the ground in which they are cut has usually had time, and the footsteps of ages, to consolidate it. In such cases, the base of the triangle is frequently made equal to half the perpendicular. Cases, of course, occur in which steeper banks are considered indispensable; and then, to prevent slips, the earth must have a coating to keep it up, which may be of fascines, hurdles, planks, or sand-bags, for temporary works, or those constructed in the midst of action; while the most solid masonry performs the same function in fortresses of a more permanent nature. This outer coating is denominated a *revêtement.*

In fig. 7, *ghi*, is the *glacis*, formed during the excavation of the ditch, and having for object the bringing of an advancing enemy into the best line of fire from the parapet. The base and perpendicular of its interior slope, *gh*, should be equal; the slope of the outer face should be one in twelve, unless the slope of the ground render some different angle desirable. An advanced glacis, *k* in fig. 7, is sometimes adopted, in order that the enemy may the sooner be brought under fire. It is absolutely necessary that the crest of the parapet should be five and a half feet higher than the crest of the glacis, as, otherwise, an assailant having reached the latter, would be able to pour a musketry-fire over the former into the work. No part of any glacis, whether near or advanced, should be more than two feet below the line of fire from the parapet—i. e., the line joining the crests of the parapet and glacis continued; if more depth be allowed, the enemy may advance in a crouching posture, without being liable to be hit. Advanced glacis are usually made of earth thrown up in prolonging beneath the ground the plane of the preceding glacis. They may be defended entirely from the parapet, in which case palisades or abattis are often fixed (as in fig. 7) to delay the advancing enemy when at the point of greatest exposure. On the other hand, these advanced glacis are occasionally defended as a series of advanced intrenchments, and only abandoned, one by one, as the defenders are driven in towards their main work.

The dimensions of the ditch depend in some measure on the amount of earth required for the parapet and glacis; but in addition to being the mine whence the materials for the latter works are drawn, the ditch must also oppose a considerable obstacle to any hostile advance. To do this effectually, the minimum width across the top is 18 feet; its depth need only be limited by the trouble of raising the earth; but in practice 12 feet is found the greatest which can be conveniently arrived at. Having ascertained the profile of the parapet, with its banquette or banquettes, bonnets, traverses, glacis, &c., it becomes a mere matter of mensuration to compute the area of a section, to multiply it by the length, and so to obtain the cubic feet of earth required. With the length of the ditch known, a very simple calculation then exhibits its width and depth—a small allowance being made for the fact that the earth, dug out from the ditch, where it has probably been long compressed, will occupy somewhat more space when thrown up, and broken into clods, for forming the parapet.

The *scarp*, or inner face of the ditch, is most difficult of ascent by the assailant, when in a continuous line with the parapet (as in fig. 7); but sometimes it would be dangerous to construct the work with this continuity, as damage to the scarp would jeopardise the stability of the parapet. In these cases a narrow step, called a *Berm* (q. v.) of from two to four feet, is made to intervene between the foot of the parapet and top of the scarp: as a precaution, it is covered with all possible obstacles to any lodgment being effected on it by the enemy. When a berm is employed, greater steepness is usually given to the scarp.

The *counterscarp*, or outer sloping side of the ditch, should be somewhat steeper than the scarp.

The bottom of the ditch should slope from both sides towards the centre, to carry off the water; and obstacles should be scattered about to prevent an enemy from forming his troops in the ditch.

Earthworks in Field Fortification.—As the most readily constructed, earthworks naturally recommend themselves to the engineer, who, in the field, is called upon to defend the position of an army against sudden attack. Their utility has been shewn in their employment from the earliest times; and modern experience tends to prove that earth-parapets are of all fortifications among the most difficult to overcome. An army manœuvring before a superior force, can scarcely hope to avoid battle being thrust upon it, unless, strengthened by fieldworks, it be rendered more nearly equal to the adversary. Napoleon, Marlborough, Eugène, Wellington, have given their names as witnesses to the indispensability of such works. The Russian parapets at Borodino made the French victory so sanguinary a triumph that it was useless to the victors. A few redoubts at Pultowa saved Peter the Great from total defeat by his formidable Swedish rival. The world-famed lines of Torres Vedras enabled Wellington with 50,000 troops, half of whom were untried Portuguese, to withstand for five months, and ultimately to drive back, the hitherto victorious army of 70,000 French, under such commanders as Masséna, Ney, and Junôt. The earthworks surrounding Sevastopol partook greatly of the nature of fieldworks for the protection of a large army, and history will not forget to recount the resistance they offered for almost a year to the best troops of the civilised world.

For a line, whether of earth or masonry, to be efficient, it must combine artillery fire with that of musketry. The guns will generally be so placed as to command some specific line of approach, such as a ravine, a line of abattis, or some portion of the glacis. They should themselves be as little exposed as possible, nor should the gunners be uncovered more than is absolutely requisite. To effect this, the gun is generally made to fire through an *embrasure* (q. v.) in the parapet, instead of over the latter. The embrasure is a cutting through the solid parapet, 20 inches wide at its inner extremity, and outwards half as much as the width of the parapet. In cases where it is necessary, for proper command, that the line of fire should not be lower than the top of the parapet, the embrasure is made through an additional parapet—raised, as in the previous case of the bonnet, above the original one. The bottom of the embrasure is called the *sole*, and slopes downward sufficiently to allow of a certain depression being given to the gun. The remainder of a parapet below the sole is the *genouillerè* (from *genou*, a knee), and in field fortification should be three and a half feet high; the portion between two embrasures is the *merlin* (Ital. *merlone*, battlement); and an embrasure need not cut the parapet perpendicularly, an angle being admissible, when an oblique fire is necessary. When, however, the obliquity would exceed 70°, it is usual, in order that the thickness of the parapet should not be too much diminished, to form a projecting angle in it, through which the embrasure is cut (as in fig. 8). The sides of the embrasures are *cheeks*, and require revêting.

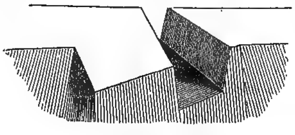


Fig. 8.

A *barbette* is a platform raised behind a parapet, higher than the general interior, with a view to guns being fired from it over the parapet.

There are certain fixed rules in all fortification, such as:—1. The length of lines must never exceed musketry range, or the flanking-works would become ineffective for their object. 2. The angles of defence should be about right angles. 3. Salient angles should be as obtuse as possible. 4. Ditches should have the best possible flanking. 5. The relief of the flanking-works must be determined by the length of the lines of defence. 6. The value of almost every detached work depends on the support it can give to or receive from an army or other work or works. 7. The reduction of every fortified work is merely a question of time; and a work fairly surrounded is sure to fall, unless relieved from without.

Fieldworks, which, it must be borne in mind, are intended merely to support or strengthen an army, may either have a complete circuit of parapets, or may be open at the gorge in the rear. The latter are, of course, the simplest; but they are only available in positions which the enemy cannot turn, or where protected by the sweeping fire of other works behind. Of this class the *Redan*, a mere salient angle (see fig. 9), is the simplest and the representative form. Of the closed forts, there are *Redoubts*, usually square; *Star-forts*, now considered objectionable; bastioned forts, as in fig. 10, which flank their own ditches almost perfectly, while scarcely susceptible of being flanked themselves. To understand the nature of a single bastion, see A (fig. 10), which represents one at the corner of a square work; *ab* is the left *flank*, *bc* the left *face*, *cd* the right *face*, *de* the right *flank*; *ae* is the *gorge*; *af*, *fe* are the *demi-gorges*, being continuations of the sides, or curtains, of the work; *a* and *e* are the left and right *curtain angles*; *b* and *d*, the left and right *shoulder angles*, and *c* is the *flanked angle*.

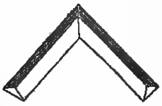


Fig. 9.—Redan.

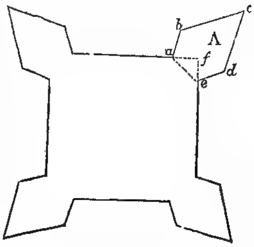


Fig. 10.—Bastioned Fort.

Continued lines are simple parapets, either connecting fortified posts, or covering the front or flank of an army. Redans joined by curtains (as in fig. 11) are those most easily constructed; but as the ditches can only be defended by an oblique fire, the curtains are occasionally so broken as to form nearly right angles with the faces of the redan, as in the dotted line; they then become *lines of tenailles*.

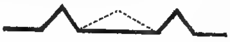


Fig. 11.—Continued line of Redans.

Lines en Crémaillière have long faces with perpendicular flanks. *Lines with intervals* are often as effective as continued lines. They consist of detached works, in two lines, within musketry

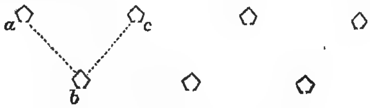


Fig. 12.—Line with intervals.

fire of each other. The re-entering angle, *abc* (fig. 12), should as nearly as practicable be a right angle. The celebrated lines of Torres Vedras, before adverted to, consisted of 150 detached forts.

Tête-du-pont, is a work constructed to cover the approaches to a bridge, and will be found described under BRIDGE-HEAD.

A *tenaille* is the reverse of a redan, and consists of two faces forming a re-entering angle: it can only be used in connection with some other work.

A *flèche* is a breastwork of two faces, forming a salient angle, constructed on the exterior of a glacis, usually at its foot, in order to defend the ground before a bastion or ravelin.

Having now explained the principal forms which elemental works of fortification are made to assume, we proceed to describe—very briefly, of course—the systems into which these have been incorporated for the defence of fortresses, towns, and other permanent purposes. It will merely be necessary to state, in addition to what has been already written, that a *rampart* is a raised structure of earth or stone, above the mean level of the country, on which the parapets, &c., can be thrown up, and which affords to the town or space protected the extra cover of its height, while it elevates the inner works sufficiently to enable them to command and fire over those situated exteriorly to themselves. It need scarcely be said that a line which can be made of earth may equally be constructed of any other material which circumstances may render desirable, the maximum resistance and minimum liability to splinter being the qualities to be chiefly considered.

SYSTEMATIC FORTIFICATION FOR PERMANENT WORKS.—Adverting to the most ancient fortifications mentioned in history, we find Greek cities surrounded with walls of brick and rubble, and occasionally of stone in huge blocks. Babylon had a wall of prodigious circuit—100 feet high, 32 feet thick, and surmounted by towers. Jerusalem, at the time of Vespasian's siege, had similar walls with masonry of enormous solidity. These seem to represent fortification as it stood from the time of that emperor to the introduction of cannon for breaching purposes. Then the square and round towers, which had formed sufficient flanking defence against arrows, proved useless when cannon-balls, fired from a distance, were the instruments of assault. At the same time, the walls, which had resisted battering-rams, crumbled to atoms under the strokes of artillery.

Fortunately, however, the art of defence has always made equal progress with that of attack; and, early in the 15th, if not late in the 14th c., the Italians had commenced to flank their walls with small bastions. The bastions at Verona, built by Micheli in 1523, are usually looked upon as the oldest extant specimen of modern fortification. Tartaglia and Albert Dürer, painter and engineer, were early in the field. In most of the earlier systems the face of the bastion was perpendicular to its flank. The first principles were successively improved by Marchi, an Italian, who died 1599, by Errard Boisle-Duc, and De Ville, under Henry IV. and Louis XIII. of France. The Count de Pagan, whose treatise appeared in 1645, did much towards demolishing previous errors, and laid the basement of that science which Vauban subsequently wrought almost to perfection. Born in 1633, Vauban had a genius which penetrated in every direction, equally in the ways of war and in those of peace. He might possibly have taught how fortresses could be rendered impregnable, had not the restless ambition of his master, Louis XIV., led him to demonstrate, first, that the reduction of any work was a mere question of time and powder. His talent so improved the system of attack, that even he himself could not construct a rampart that should withstand the fire conjured up against it by his discoveries. He constructed 33 new fortresses, improved above 100, and conducted personally more than 50 sieges. To him are soldiers indebted for the sweeping fire of ricochet, and to him in a degree for the traverses which endeavour to render it harmless. Coehoorn, director-general of the fortresses of the United Provinces, was the contemporary, rival, and opponent of Vauban; his master-piece is Bergen-op-Zoom. Cormontaigne, Belidor, Montalembert, Bousmard, and Carnot may also be mentioned as conspicuous masters in the science.

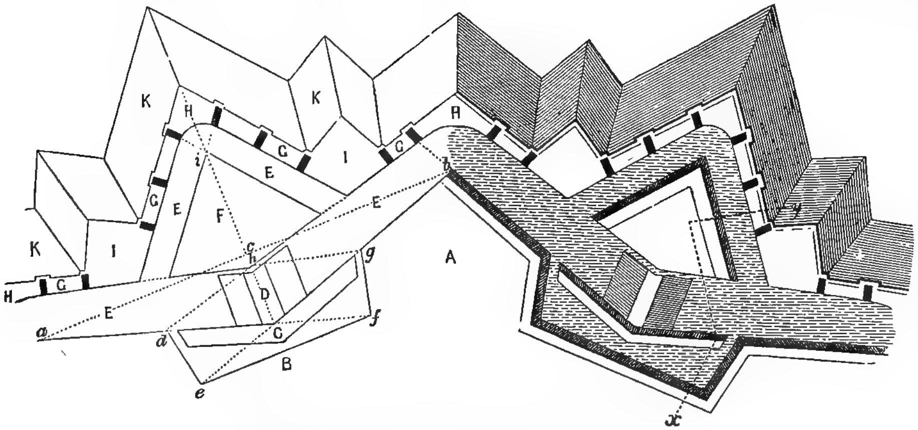


Fig. 13.—Vauban's First System; Ground-plan:
A, bastion; B, curtain; C, tenaille; D, caponnière; E, ditch; F, ravelin; G, covert-way; H, salient place of arms; I, re-entering place of arms; K, glacis.

Irrespective of irregularities in the form of the place to be defended, a particular polygon is selected as that on which the lines of defence are to be drawn. Each side of this is a *face of defence*, and the length of a side is rarely made greater than 360 yards.

Vauban's first system is shewn in fig. 13 as regards the outline of its ground-plan; fig. 14 displaying the same in profile.

In this instance, the polygon taken is an octagon. Let ab (fig. 13) be a side of this polygon; bisect this in c, and draw a perpendicular to ab. On this, inwards, mark off cC one-sixth of ab; join aC, bC, and produce the lines; then from a and b respectively mark off ad, bg, each equal to $\frac{2}{7}$ ab, for the faces of the bastions. Next, from a and b as centres, with radius, ag, describe arcs cutting aC, bC, produced in f and e; join de, fg, for the flanks of bastions, and ef for the curtain of the work. The first line of defence is then complete, the necessary parapets, &c., being of course raised on the site laid out. From an examination of this, it will be seen that the whole space in the front is covered. The faces of the bastions and the curtain command more or less the entire front, while the bastion flanks sweep along the faces of adjoining bastions and along the curtain. In front, however, of the apex of each bastion, the line of advance is only covered by an extremely oblique fire. To obviate this, a ravelin, F, is constructed on the further side of the main ditch, which commands the doubtful fronts, and, at the same time, forms an outwork capable of assisting in the general scheme of defence. To trace the main ditch, describe from the flanked angle of the bastion, a or b, an arc with radius 30 yards (if dry

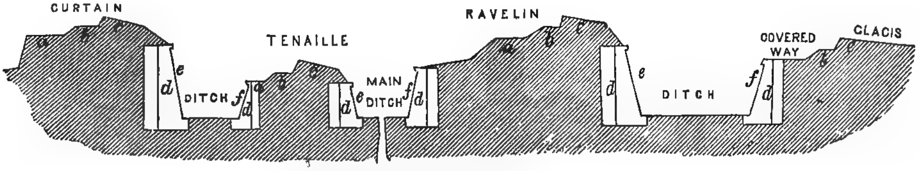


Fig. 14.—Vauban's First System; Profile:
a, b, banquettes; c, parapet; d, ravêtement; e, escarp; f, counterscarp.

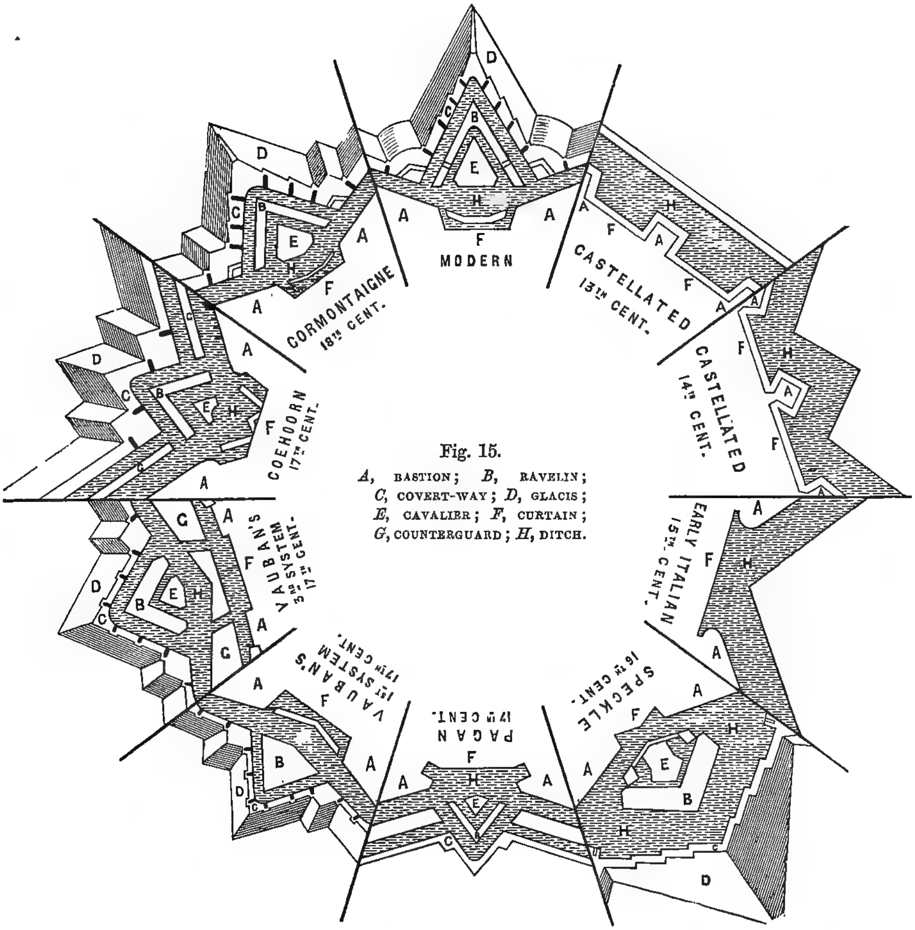


Fig. 15.
A, bastion; B, ravelin; C, covert-way; D, glacis; E, cavalier; F, curtain; G, counterguard; H, ditch.

ditch, 36 if wet), and from these arcs draw tangents to the shoulders, d and g, of the opposite bastions. These tangents, meeting in the line cC, form the counterscarp line of the main ditch. From h, the re-entering angle of the counterscarp, set off 100 yards along the perpendicular to i, which will be the apex of the flanked angle of the ravelin. From i, draw lines to points situated in the faces of the bastions, 10 yards from the shoulder angles; these lines to the points intersecting the counterscarp give the faces of the ravelin. The ditch of the ravelin is 20 yards wide, with counterscarp parallel to the escarp. The zigzag line now arrived at gives the inner side of the covert-way—10 yards wide—behind the glacis, which last slopes gradually towards the country, and is ordinarily the outer work of all. The tenaille is a comparatively low parapet sweeping the depressed interior of the ravelin, and commanded by the bastions and curtain.

The caponier, forming a communication between the tenaille and the ravelin, consists of a passage between two low parapets, each with a glacis sloping towards the ditch, which is swept from the work.

Nine feet clear are allowed round the traverses on the covert-way; at the re-entering angles of the covert-way, *places of arms* are formed by setting off 30 yards on each side, and with this as gorge, advancing faces inclined to each other at 100°. If the polygon had been a square, cC would have been $\frac{1}{8}\,ab$; if a pentagon, $\frac{1}{7}\,ab$; and for any polygon of more sides than seven, $\frac{1}{6}\,ab$.

Vauban's second and third systems were those in which he adapted old walls to his modern improvements. Availing himself of the works already formed, he added counterguards in front of the corner-towers, thereby making hollow bastions, and avoiding the necessity of entirely rebuilding.

Coehoorn's system had counterguards in front of the bastions and parallel to them. The flanked angle of his ravelin had a fixed value—viz., 70°.

Cormontaigne widened the gorge of his ravelin, thereby reducing the length of the bastion face available for breaching from without. He also revived the step-like formation of the covered way, originally seen in Speckle in the 16th c., and which gives defenders a continued line of fire from each traverse along the covert-way.

The modern system differs but little from that of Cormontaigne. The re-entering places of arms have circular fronts instead of angular; the angle of the ravelin is fixed at 60°, and all the best points of older styles are associated.

Fig. 15 is intended to present at one view a representation of the systems in force since artillery came into common use, as well as the gradual transition from square towers on castle walls to flanked bastions on modern lines. The elements of fortifying against shipping will be found under MARINE FORTIFICATION; the principles of attacking fortresses generally, under SIEGE, and MINES, MILITARY.

FORTIGUE'RRA, NICOLO, an Italian poet, was born at Pistoja, November 7, 1674. Destined from youth for the church, he proceeded to Rome at an early period, where the power of the prelate Carlo A. Fabroni, who was his relative, speedily secured him advancement, and where he was ultimately raised to the dignity of prelate and papal chamberlain by Clement XI. An ardent cultivator and protector of letters, it must be owned that F.'s own compositions are more prized for a certain rich joviality of imagery, and profuse facility of language, than for any salient beauty of style or conception. His chief work, *Il Ricciardetto*, was originally commenced in confutation of friends, who maintained that the striking ease and fluency of Ariosto, Berni, and other poets of a similar school, were but apparent, and in reality the fruit of deep art and severe labour. F., in *a few hours* threw off an entire canto of *Il Ricciardetto*, strikingly in imitation of the above poets, and continued the work at random much beyond its originally designed limits. It was published in 1738, two years after his death, and met with unequivocal favour, notwithstanding the incredible incidents and licentious images with which it is replete. F. died 7th February 1735.

FORTRO'SE, or **FORTROSS**, a parliamentary and royal burgh, seaport, and watering-place in the east of Ross-shire, on the west side of the Moray Firth, opposite Fort George, ten miles north-north-east of Inverness. Pop. (1861) 928. It unites with Inverness, Forres, and Nairn in sending a member to parliament. F. had a fine cathedral and a bishop's palace; but both of these buildings were partially destroyed under Cromwell, and the stones sent to Inverness, to be used in building a fort there. It has a good trade in various kinds of produce, as pork, eggs, all sorts of grain, and potatoes. In the 16th c., F. had a considerable trade, and is said to have been the seat of arts, science, and divinity in the north of Scotland. Chanonry, with which it was united in 1444, was formerly the see of the bishops of Ross.

FO'RTS AND FORTALICES. The military power of the state is intrusted by the constitution of this country to the sovereign. After having been unconstitutionally claimed by the Long Parliament in the time of Charles I., it was again vindicated for the crown by 2 Car. II. c. 6. This branch of the royal prerogative extends not only to the raising of armies and the construction of fleets, but to the building of forts and other places of strength. Sir Edward Coke lays it down (1 *Inst.* 5), that no subject can build a house of strength embattled without the licence of the king; and it was enacted by 11 Henry VII. c. 18, that no such place of strength could be conveyed without a special grant.

FORTU'NA, called by the Greeks, *Tyche*, was in classical mythology the Goddess of Chance. According to Hesiod, she was a daughter of Oceanus; according to Pindar, a sister of the Parcæ. She differed from Destiny or Fate, in so far that she worked without law, giving or taking away at her own good pleasure, and dispensing joy or sorrow indifferently. She had temples at Smyrna, Corinth, and Elis. In Italy, she was extensively worshipped from a very early period; and had many names, such as *Patricia*, *Plebeia*, *Equestris*, *Virilis*, *Primigenia*, *Publica*, *Privata*, *Muliebris*, *Virginensis*, &c., indicating the extent and also the minuteness of her superintendence. Particular honours were paid to her at Antium and Præneste; in the temple of the former city, two statues of her were even consulted as oracles. Greek poets and sculptors generally represented her with a rudder, as a symbol of her guiding power; or with a ball, or wheel, or wings, as a symbol of her mutability. The Romans proudly affirmed that when she entered their city, she threw away her globe, and put off her wings and shoes, to indicate that she meant to dwell with them for ever.

FORTUNATE ISLANDS. See CANARIES.

FORTUNA'TUS is the title of one of the best people's books (*Volksbücher*) ever written. It originated about the middle of the 15th c., though many of the tales and legends included in it are of much older date. The opinion that it was worked up into German from a Spanish or English original may be considered as set aside. The substance of the book is that F., and his sons after him, are the possessors of an inexhaustible purse of gold and a wishing-cap, which however, in the end, prove the cause of their ruin. The moral is, that worldly prosperity alone is insufficient to produce lasting happiness. The oldest printed edition of the book now extant bears the date Frankfurt am Maine, 1509. Later German editions mostly bear the title, *Fortunatus, von Seinem Seckel und Wunsch-hütlein* (Fortunatus: Story of his Purse and Wishing-cap. Augsb. 1530; Nürnb. 1677; and Basel, 1699). It has been reprinted in Simrock's *Deutsche Volksbücher* (3 vols., Frankt. am Maine, 1846). Various French versions of the German story have appeared from time to time, as the *Histoire de Fortunatus* (Rouen, 1670); which served as the groundwork of the Italian *Avennimenti de Fortunatus e de' Suoi Figli* (Naples, 1676). From the German original, have also sprung, among others, the Dutch version *Een Nieuwe Historie van Fortunatus Borse en van Zijnen Wensch hoed* (Amst. 1796); later, the English *History of Fortunatus and his Two Sons* (London, no date); the Danish *Fortunati pung og önskehat* (Kopen. 1664, 1672, 1695, 1756, 1783); the Swedish *Fortunatus* (1694); and about 1690, two Icelandic versions, one in verse and another in prose. The first to dramatise the subject was Hans Sachs, in his *Der Fortunatus mit dem Wunschseckel* (1553), after whom comes the English Thomas Decker with his *Pleasant Comedie of Old Fortunatus* (1600), a work which had the honour to make its reappearance in German about the year 1620. The most poetical edition of the story is that given by Tieck in his *Phantasus* (3 vols., Berlin, 1816). See Grässe's *Die Sagenkreise des Mittelalters* (Dresd. and Leip. 1842), and Ersch and Gruber's *Encyclopædie* (first sect., vol. 46).

FORTUNE-TELLER. Under the designation Vagabonds, in the Scottish Act 1579 c. 74, are included all who go about pretending to foretell fortunes. The punishment inflicted on them by the statute is scourging and burning on the ear.

FO'RUM, a Latin word, which originally signified an 'open place,' and is probably connected with *foras*, 'out-of-doors.' The Roman *fora* were places where the markets and courts of justice were held. The former were termed *fora venalia*, and the latter *fora judicialia*. Of the *fora judicialia*, the most ancient and celebrated was the *forum Romanorum*, or, *par excellence*, the *forum magnum*, occupying the quarter now known as the *campo vaccino* (or cattle-market). It stretched from the foot of the Capitoline Hill, where the arch of Septimius Severus stands, to the temple of the Dioscuri, was seven *jugera* in extent, and was surrounded by streets and houses. The boundary on the east and north was the *Sacra via*, of which the side nearest the forum was left open; while on the other were corridors and halls, such as those of the *argentarii* (bankers or money-changers). At a later period, the site of these was, for the most part, occupied by basilicas and temples. In the eastern portion of this space, were held the earliest *Comitia* (q. v.) of the Romans—the *comitia curiata;* hence this part took the name of the *comitium*, and was distinguished from the forum strictly so called. Here were hung up for the benefit of the public the laws of the Twelve Tables; and, after 304 B. C., the *Fasti* written on white tables to inform the citizens when the law-courts were open. The *Forum*, in the narrower usage of the word, probably ceased to be employed as a market-place about 472 B. C., when it became the place of assembly of the *Comitia Tributa*. Of the later *fora venalia*, the principal were the *forum boarium* (the cattle-market), the *forum suarium* (pig-market), *piscatorium* (fish-market), *olitorium* (vegetable-market), &c. Public banquets for the populace, and the combats of the gladiators, were, in the time of the republic, usually held in the great forum, which also contained monuments of various kinds, of which may be mentioned the famous *Columna Rostrata* of C. Duilius, erected in memory of his victory over the Carthaginians. The rostra, or platforms from which public orations were delivered, formed the boundary between the forum in its narrower usage and the comitium. After the time of Julius Cæsar and Augustus, the Forum Romanorum lost the importance it had previously derived from being the central point of Roman political life. The other two *fora judicialia* were the *Forum Julii* and the *Forum Augusti*. Compare Becker, *Handbuch der Röm. Alterthümer* (1 vol., Leipsic, 1843).

FORUM CO'MPETENS, in Law, is the court to the jurisdiction of which the party is amenable.

FOSCARI, Francesco, Doge of Venice from 1423 to 1457, a brilliant period of conquest and prosperity to his country, and of unexampled affliction to himself and family. Born about 1370, his aspiring ambition soon fired him with passionate eagerness to exalt his reign by the glory of conquest, and speedily involved the state in a severe conflict with the Dukes of Milan; which, however, the doge's great military ability in the end turned into a source of glory and aggrandisement to Venice. His triumph was embittered by the successive loss of three sons; and the one who remained to transmit the name, and succeed to the inheritance of the family, was, in 1445, denounced for having received bribes from the hostile generals, to use his influence with the doge in procuring less rigorous terms. Tried for this grave crime before the Tribunal of the Ten, and racked cruelly in view of his father, Giacopo Foscari was banished for life, under pain of death should he attempt to revisit his native land. In 1450, the assassination of one of the 'Council of Ten,' Hermolao Donati, was imputed, on what seem most unfounded grounds, to Giacopo, who was consequently summoned from his exile, tried, tortured, and banished a second time on still more rigorous terms to the island of Candia. Grown reckless through suffering, and longing to see his home and country on any terms, Giacopo petitioned the Duke of Milan to intercede in his behalf with the senate, a step which, by Venetian law, was punished as a high crime, and led to the unfortunate Giacopo being for the third time subjected to torture and renewed banishment, on entering into which he died of grief. The doge had vainly besought permission to resign a dignity grown loathsome to him, from its imposing the barbarous obligation of witnessing his son's torture; but in the end he was deposed, and ordered to vacate the palace in three days. At the age of 87, decrepit from years, and bowed by sorrow and humiliation, Francesco F., supported by his venerable brother, descended the Giant's Staircase, and passed out for ever from the ducal palace, the scene of such vain pomp and bitter misery. Pasqual Malapieri was elected in his stead in 1457, and at the first peal of the bells in honour of his elevation, F. expired from the rupture of a blood-vessel. Byron has written a tragedy on the subject, entitled *The Two Foscari*.

FO'SCOLO, Ugo, an Italian author, was born about 1778, at Zante, one of the Ionian isles, and proceeded to Venice in his 16th year, where for a time he pursued his studies, repairing later to Padua to enjoy Melchiore Cesarotti's noble course of classic literature. His earliest efforts at poetical composition were strictly modelled on his favourite Greek classics; and, as early as 1797, his tragedy, *Il Tieste*, was received with favour by a critical Venetian audience. The dismemberment of the Venetian states, decreed by the treaty of Campo Formio, bitterly incensed F.'s patriotic spirit, and inspired him with one of his most remarkable works, *Le Lettere di Jacopo Ortis*, which, owing to the fierce political excitement then prevailing throughout the entire peninsula, was received with immense popularity. F. repaired to Milan on its being declared the capital of the Cisalpine republic, and there obtained the grade of officer in the Lombard legion. On the downfall of the republic, he retreated with the French into Genoa, where, in the midst of the terrors of a rigorous siege, he composed two exquisite odes to *Luigia Pallavicini Caduta da Cavallo*, and *All' Amica risanata*. F. subsequently entered France with the intention of joining Napoleon's expedition against England, and prepared a much admired version of Sterne's *Sentimental Journey*, to exercise himself in English. On the failure of the plan, he returned to Milan, and prepared a splendid edition of Montecuculi's works, with notes and historical references—*Opere di Raimondo Montecuculi, per* Luigi Mussi (Milan, 1807—1808), a very rare edition. At this time, he also published his exquisite poem, in blank verse, *I Sepolcri*, which at once placed him among the classic authors of his country. In the same year, he was appointed to the chair of eloquence in Pavia, and continued to occupy the post, to the delight and benefit of his students, until the professorship was suppressed in all the colleges of Italy. His inaugurative address, *Dell' Origine e dell' Ufficio della Letteratura*, is a masterpiece of beautiful, noble, and patriotic writing. From the time F. lost faith in the sincerity of Bonaparte's intentions to his country, he not only ceased to worship his early idol, but employed the full powers of his wrath and sarcasm in denouncing his treachery. After various vicissitudes, F. finally sought refuge in Britain about 1816, and soon mastered the language sufficiently to contribute to the *Quarterly* and *Edinburgh Reviews*. In London, some of his best writings were published—viz., *Essays on Petrarca and Dante, Discorso sul testo del Decamerone, Discorso storico sul testo di Dante*, and various minor compositions. He died October 10, 1827, of dropsy, at Turnham Green near London. His works in prose and verse were published in Milan, 1822, by Silvestri.

FOSS, or **FOSSE** (Lat. *fossa*, from *fodio*, I dig), in Fortification, is a ditch or moat, either with or without water, the excavation of which has contributed material for the walls of the fort it is designed to protect. The foss is immediately without the wall, and offers a serious obstacle to escalading the defences.

FO'SSA ET FU'RCA, or **PIT AND GALLOWS**, was an ancient privilege granted by the crown to barons and others, which implied the right of drowning female felons in a ditch, and hanging male felons on a gallows.

FOSSA'NO, a town of Piedmont, in the administrative division of Coni or Cuneo, is situated on the left bank of the Stura, on a hill surmounted by an old castle, 14 miles north-east of Coni. It is surrounded with old walls, and is well built; but the houses are erected over arcades, under which run the footways, and thus the streets have a somewhat gloomy appearance. It has a handsome cathedral, ten churches, a royal college, and numerous minor educational institutions, silk-factories, paper-mills, and tanneries. Pop. 16,423.

FO'SSIL (Lat. *fossilis*, dug out of the earth), a term formerly applied, in accordance with its derivation, to whatever was dug out of the earth, whether mineral or organic, but now restricted to the remains of plants and animals imbedded in the earth's crust. They were formerly, and are sometimes still, called petrifactions. They occur in nearly all the stratified rocks, which have, on this account, been called Fossiliferous strata. It is difficult or impossible to detect them in the metamorphic rocks, for the changes that altered the matrix have also affected the organisms, so as either almost or altogether to obliterate them. In the fundamental mica-schist and gneiss they have escaped notice, if ever they existed; and it is only within the last few years that their presence has been detected in the gneiss and other rocks, which are the greatly metamorphosed representatives of the Lower Silurian Measures in the north of Scotland.

The conditions in which fossils occur are very various. In some Pleistocene beds the organic remains are but slightly altered, and are spoken of as sub-fossil. In this state are the shells in some raised sea-beaches, and the remains of the huge struthious birds of New Zealand, which still retain a large portion of the animal basis. In the progress of fossilisation, every trace of animal substance disappears; and if we find the body at this stage, without being affected by any other change, it is fragile and friable, like some of the shells in the London clay. Most frequently, however, a petrifying infiltration occupies the cavities left in the fossil by the disappearance of the animal matter, and it then becomes hardened and solidified. Sometimes the whole organism is dissolved and carried off by water percolating the rock, and its former presence is indicated by the mould of its outer surface, and the cast of its inner in the rocky matrix, leaving a cavity between the cast and the mould agreeing with the size of the fossil. This cavity is occasionally filled up with calcareous spar, flint, or some other mineral; and we thus obtain the form of the organism, with the markings of the outer and inner surfaces, but not exhibiting the internal structure. The most advanced and perfect condition of fossilisation is that in which not only the external form, but also the most minute and complicated internal organisation is retained; in which the organism loses the whole of its constituents, particle by particle, and as each little molecule is removed, its place is taken by a little molecule of another substance, as silica or iron pyrites. In this way we find calcareous corals perfectly preserved in flint, and trees exhibiting in their silicified or calcified stems all the details of their microscopic structure—the cells, spiral vessels, or disc-bearing tissue, as well as the medullary rays and rings of growth.

FOSSIL FERNS. As far as has been yet determined from the rocky tablets of the earth's crust, ferns first appeared in the Devonian period, but then only sparingly, not more than nine or ten species having been observed. In the immediately succeeding Coal-measures, they suddenly reached their maximum development. The dense forests and the moist atmosphere of this period were so suited to their growth that they formed a large bulk of the vegetation. Upwards of 350 species have been described, some of them tree ferns of a size fitting them to be the companions of the immense Sigillarias and Lepidodendrons whose remains are found associated with theirs in the Carboniferous rocks. Twenty-three species have been found in Permian strata. Many new forms appear in the Trias, and their number is increased in the Oolite. The fresh-water beds of this period contain numerous beautiful ferns, upwards of fifty species having been described. The marine beds of the Cretaceous period contain very few forms, and in the Tertiary rocks they are equally rare.

FOSSILI'FEROUS ROCKS are those which contain organic remains. If we except the lowest metamorphic rocks, in which, as yet, no fossils have been found, the term is equivalent to the 'stratified rocks,' when used comprehensively; but it may also be applied to a particular bed, as when we speak of an unfossiliferous sandstone compared with the neighbouring fossiliferous shale or limestone.

FOSSOMBRO'NÉ, a small episcopal town of Italy, in the province of Urbino and Pesaro, is pleasantly situated on a hill on the left bank of the Metauro—which is here spanned by a fine modern bridge—11 miles east of the town of Urbino. It rose in the 14th c., from the ruins of *Forum Sempronii*, destroyed by the Goths and Lombards. Some interesting Roman inscriptions and remains of the ancient city are contained in the cathedral of St Aldobrando. F. is celebrated for its fine manufactures of carpets and woollen cloths, and particularly for the excellent silk of its neighbourhood. Three miles from F. is Il Monte d'Asdrubale, famous as the scene of the engagement in which the Carthaginian general was defeated and killed by the Romans in 207 B. C.—See Lauro Jacomo, *Historia e Pianta di Fossombrone.*

FOSTER, JOHN, a well-known English essayist, was born in the parish of Halifax, Yorkshire, September 17, 1770. He was educated for the ministry at the Baptist College at Bristol, but after preaching for several years to various small congregations with very indifferent success, he resolved to devote himself mainly to literature. His *Essays, in a Series of Letters*, were published in 1805, while he was officiating as pastor of a Baptist chapel at Frome, in Somersetshire. They were only four in number—On a Man's Writing Memoirs of Himself; On Decision of Character; On the Application of the Epithet Romantic; and On some of the Causes by which Evangelical Religion has been rendered less acceptable to Persons of Cultivated Taste; yet Sir James Mackintosh did not hesitate to affirm that they shewed their author to be 'one of the most profound and eloquent writers that England has produced.' They have been remarkably popular, especially among the more thoughtful of the community, and have gone through upwards of twenty editions. In 1808, F. married the lady to whom his essays were originally addressed, and retired to Bourton-on-the-Water, in Gloucestershire, where he lived a quiet, studious, literary life, preaching, however, in the villages round about on Sundays. In 1819 appeared his celebrated *Essay on the Evils of Popular Ignorance*, in which he urges the necessity of a national system of education. He was long the principal writer in the *Eclectic Review*, and a selection from his contributions to that magazine was published by Dr Price in 1844. He died at Stapelton, near Bristol, October 15, 1843. F. was a man of deep but sombre piety. The shadows that overhung his soul were, however, those of an inborn melancholy, and had nothing in common with the repulsive gloom of bigotry or fanaticism. His thinking is rugged, massive, and original; and at times, when his great imagination rouses itself from sleep, a splendour of illustration breaks over his pages that startles the reader both by its beauty and its suggestiveness. Besides the works already mentioned, F. published several others, of which the most important is an *Introductory Essay to Doddridge's Rise and Progress of Religion* (1825). Compare the *Life and Correspondence* of F. (2 vols. 1846), edited by J. E. Ryland, and republished in Bohn's Standard Library in 1852.

FO'THERGILL PROCESS. This is one of the numerous dry processes in Photography (q. v.) which have for their object the preservation of sensitive plates ready for exposure. It is named after the inventor, and consists in the partial removal of the free nitrate of silver which adheres to the collodion film on withdrawing it from the sensitising bath by washing with water, and the subsequent conversion of the remaining free nitrate of silver into albuminate and chloride of silver by pouring over the plate dilute albumen, containing chloride of ammonium, the excess of albumen being finally washed off by violent agitation with a copious supply of water. The plates being set aside to drain on folds of blotting-paper, are, when dry, ready for use. For details of manipulation, see Hardwich's *Photographic Chemistry.*

FOUCHÉ, JOSEPH, Duke of Otranto, the son of a sea-captain, was born at Nantes, 29th May 1763, and educated at the Oratoire. He hailed the Revolution with enthusiasm, and in 1792 became a member of the National Convention. He voted for the death of Louis XVI., and was one of the commissioners of the Committee of Public Safety sent to Lyon in 1794 to reduce that city to obedience. In 1795, he was expelled from the Convention as a dangerous Terrorist, and kept in confinement for a short time. After the revolution of the 18th Brumaire (5th November 1799), in which he took a part, F., as minister of police (an office to which he had been appointed on the 31st July of the same year), organised an extraordinary police. He restrained the new government from deeds of violence, and by his advice the list of *émigrés* was closed, a general amnesty proclaimed, and the principle of moderation and conciliation steadily adhered to. His remark upon the execution of the Duke d'Enghien was very happy: '*C'est bien pis qu'un crime, c'est une faute*' (It is much worse than a crime; it is a *blunder*). In July 1804, he was again placed at the head of the police. His chief endeavours were directed, as before, to attaching the royalists to the imperial throne by prudent moderation. In 1809, the Emperor conferred on him the title of Duke of Otranto, along with large grants from the revenues of the Neapolitan territory. An unguarded expression, however, in a proclamation, lost him the favour of Napoleon, and in the following year he was forced to resign. In the campaign of 1813, the Emperor summoned F. to head-quarters at Dresden, and sent him thence as governor of the Illyrian provinces, and, after the battle of Leipsic, to Rome and Naples, in order to keep a watch upon Murat's proceedings. Being recalled to Paris in the spring of 1814, he predicted the downfall of Napoleon even before his arrival in France. After the Emperor's abdication, F. advised him to abandon Europe altogether. On his return from Elba, Napoleon again nominated him minister of police; but after the battle of Waterloo, F. placed himself at the head of the provisional government, brought about the capitulation of Paris, drew back the army behind the Loire, and thereby prevented unnecessary bloodshed. At the Restoration, Louis XVIII. reappointed him minister of police; but he resigned his office in a few months, and went as ambassador to Dresden. The law of the 12th January 1816, banishing all those who had voted for the death of Louis XVI., was extended to F. also, who from that time resided in different parts of Austria. He died at Trieste, 26th December 1820, leaving an immense fortune. Napoleon, at St Helena, called F. 'a miscreant of all colours;' and Bourrienne declares that he 'never regarded a benefit in any other light than as a means of injuring his benefactor'—statements which are far too exaggerated to be worth much. The simple truth appears to be, that F. was a man whose highest principle was self-interest, but whose sagacity was not less conspicuous, and who never failed to give the governments which he served the soundest political advice. It is true, however, that he was unscrupulous in passing from one party to another, and that he was as destitute of political morality as Napoleon himself. In 1824, appeared a work entitled *Mémoires de Fouché, Duc d'Otrante*, edited by A. Beauchamp, which, though declared to be spurious by the sons of F., is generally held to have been based on genuine documents.

FOUGERES, a handsome town of France, in the department of Ille-et-Vilaine, stands on a hill on the right bank of the Couesnon, 28 miles north-east of Rennes. It is a well-built town, with wide streets, and in the old quarter retains traces of the middle ages in the ancient arcades which still obtrude in some places upon the streets. The castle of F. is picturesque, but being commanded by other parts of the town, forms but a feeble defence. In the neighbourhood is a great forest containing Druidical remains. A famous engagement took place here between the Vendean royalists and the Republicans, November 15, 1793. F. has manufactures of sail-cloth, canvas, tape, flannel, lace, hats, &c.; and dyeworks, principally for the dyeing of scarlet. In the vicinity are important glass and paper works. Pop. 9344.

FOULA, a solitary isle in the Atlantic, 25 miles west of the Mainland of Shetland. It is 3 by 1½ miles in extent, and consists of five hills (highest, 1300 feet), rising steeply out of the water. The sea-cliffs are sublime, and covered with sea-birds. The isle is seen from Orkney in fine weather, and is supposed to be the Ultima Thule of the ancients. It has only one landing-place. It is inhabited by about 250 fishermen. F. consists of sandstone, with a small patch of granite, gneiss, mica-slate and clay-slate in the north-east corner.

FOULD, ACHILLE, was born in Paris on the 31st of October 1800, and was educated at the Lycée Charlemagne, one of the most celebrated establishments of Paris. He originally belonged to the Jewish creed, his family being wealthy Jew bankers, but now adheres to the Protestant faith. Early in life, he was initiated into financial transactions by his father, and his natural talents were developed by travel in Europe and the East. In 1842, he began his political career, being then chosen as a member of the council-general of the Hautes Pyrénées, and immediately after elected a deputy for Tarbes, the chief town of that department. He soon acquired a high position in the Chamber of Deputies for the peculiar talent with which he handled questions of finance and political economy. In 1844, he was appointed reporter to the commission on stamps on newspapers, and his views were adopted, in spite of the opposition party, he being at that period a stanch supporter of M. Guizot's home and foreign policy. After the revolution of 1848, F. accepted the new régime of the republic, and offered his services to the provisional government. In July 1848, he was elected representative for the department of the Seine, and continued to rise in public estimation by the elevated views he expressed in the chamber, while opposing among other things a proposed issue of assignats. During the presidency of Louis Napoleon, F. was four times Minister of Finance, and his repeated resignations for state reasons did not prevent him from being again appointed on the occasion of the *coup d'état*, 2d December 1851. He once more resigned his position on the 25th January following, in consequence of the decree ordering the confiscation of the property of the Orleans family. The same day, however, he was created a senator, and shortly afterwards returned to power as minister of state. In this capacity, he superintended the Universal Paris Exhibition in 1855, the completion of the palace of the Louvre, and other great measures. He remained one of the most confidential ministers of Napoleon III. till December 1860, when he was succeeded as minister of state by Comte Walewsky. He was out of office up to the 14th November 1861, at which date he was reappointed finance minister, his long experience and well-known ability as a financier pointing him out as the man to manage the crisis of the French finances at that time.

FOULIS, ROBERT and ANDREW, two eminent printers of Glasgow, brothers, whose names are usually classed together.—Robert, the elder, born in that city, April 20, 1707, was bred, and, like Allan Ramsay, for some time practised as a barber—in those days of flowing periwigs, a profitable and respectable profession. Having attended for several years the lectures of the celebrated Dr Francis Hutcheson, then Professor of Moral Philosophy in Glasgow University, he was advised by that gentleman to become a bookseller. In winter, he and his brother Andrew (born November 23, 1712) employed themselves in teaching languages; and in summer, they made short excursions to the continent, and thereby acquired a considerable amount of learning and knowledge of the world. Andrew seems to have been designed for the church. In 1727, he entered as a student at the university of Glasgow, where he is supposed to have undergone a regular course of study. About the end of 1739, Robert began business in Glasgow as a printer, his first publications being chiefly of a religious nature. In 1742, he published an elegant edition in 4to of *Demetrius Phalereus on Elocution*, supposed to be the first Greek work printed in Glasgow. In 1743, he was appointed printer to the university. In 1744, he brought out his celebrated immaculate edition of Horace, 12mo, each printed sheet of which was hung up in the college of Glasgow, and a reward offered for the discovery of any inaccuracy. Soon after, he took his brother Andrew into partnership; and for thirty years they continued to bring out some of the finest specimens of correct and elegant printing, particularly in the Latin and Greek classics, which the 18th c. produced, either in this country or on the continent. Among them were Cicero's works, in 20 volumes; Cæsar's Commentaries, folio; Homer's works, 4 vols.; Herodotus, 9 vols., &c.; also an edition of the Greek Testament; Gray's poems; Pope's works; a folio edition of Milton, and other publications in English. With the view of promoting the cultivation of the fine arts in Scotland, Robert Foulis, after a two years' visit to the continent in preparation, commenced, in 1753, an academy at Glasgow, for the instruction of youth in painting and sculpture. The great expense attending this institution led to the decline of the printing business, which, however, continued to be carried on till the death of Andrew, September 18, 1775. In 1776, Robert exhibited and sold at Christie's, Pall Mall, London, the remainder of his paintings, when, after all expenses were defrayed, the balance in his favour amounted only to fifteen shillings. He died the same year at Edinburgh, on his return to Scotland. He was twice married, and left several children. One of them was a printer in Glasgow as late as 1806. His Virgil, printed in 1778, and his Æschylus, 1795, for beauty and exactness, were not unworthy of the name of Foulis.

FOUNDATION. This term may be applied either to the surface or bed on which a building rests, or to the lower part of the building which rests on the natural bed. 1. Foundation as the bed.—The best that can be had is solid rock, or any kind of resisting incompressible stratum, free from water. Where there is no chance of water, sand forms a solid foundation. When the soil is soft, loose, and shifting, a solid bearing can be obtained only by driving *piles* or long beams of wood, sharpened at the end, through the soft soil, till they reach a hard bottom. This is then planked or laid with cross-beams, on which the superstructure is built. The piers of many bridges are formed in this manner. Where the soil is soft, but not shifting, as in the case of made or deposited earth, the method of *Concreting* (q. v.) is adopted—i. e., a large surface is laid with broken metal or gravel, and run together with hot lime, so as to form a broad solid artificial rock, on which the building may rest. 2. Foundation as the base of the building.—The broader and larger the lower courses of the mason-work, the stronger the wall. The stones should, if possible, extend through and through, and project on each side of the wall.

In the best periods of art, the foundations have always been most attentively considered. The Romans formed solid bearings of concrete as above described, and paid great attention to secure the stability of their buildings. In the dark ages, when there was want of knowledge combined with want of materials and means, many buildings fell from the yielding of the foundations. Some of the earlier Gothic buildings also suffered from the same cause. But knowledge came with experience, and the foundations of the later Gothic buildings, during the 14th and 15th centuries, were built with extreme care, and on the virgin soil—the stones being as finely dressed as those above ground, where necessary to resist a strong thrust. And where the weight is thrown unequally on piers and walls, these detached points are all carefully united below the floor with a net-work of solid walls.

Bad foundations have been the cause of the ruin of many modern buildings. This has arisen from the costly nature of making a good foundation, when the soil is not naturally suitable. But it is clear that no expense should be spared to make the foundation good, as the value and stability of the superstructure depend entirely on the security of the foundation.

FOU'NDER, also called LAMINITIS, consists of inflammation of the vascular sensitive laminæ of the horse's foot. It is rarely met with in cattle or sheep, owing to the corresponding structures being in them greatly less developed. Occasionally, the laminæ are strained from severe exertion; more frequently, they suffer from the morbid effects of cold, which is especially injurious after the excitement and exhaustion of labour. Very commonly also, they become inflamed from their close sympathy with diseases of the digestive organs, often following engorgement of the stomach, or inflammation of the bowels. All four feet are sometimes affected, more usually the fore ones only. They are hot and tender; the animal stands as much as possible upon his heels; trembles and groans when moved; and is in a state of acute fever and pain. Except when following superpurgation or internal disease, bleeding is useful. The shoes must at once be removed, and the toes, if long, reduced, but no further rasping or cutting is permissible. The feet must be enveloped in hot bran poultices, and kept off the hard ground by a plentiful supply of short litter. Soap and water clysters, repeated if necessary every hour, usually suffice to open the bowels, which are very irritable, and physic, if required, must therefore be used with extreme caution. Two drachms of aloes is an ample dose in founder. Have the strain taken off the inflamed laminæ by getting the animal, if possible, to lie down, or, where this is impracticable, by slinging him. When the inflammation continues so long that serum and lymph are poured out between the sensitive and horny laminæ, they must have free exit provided, by making an opening through the toe with a small drawing-knife. This may prevent the *pumiced* and disfigured feet that are apt to follow severe and repeated attacks. After the acute symptoms pass, cold applications to the feet, and a mild blister round the coronet, help to restore the parts to their natural condition.

FOUNDING, or **METAL-CASTING,** is the art of obtaining casts of any desired object by means of pouring melted metal into moulds prepared for the purpose. It has risen to great importance in recent times, on account of the many new applications of iron. Iron-founding, brass-founding, type-founding, as well as casting in bronze and zinc, are the principal divisions of the art. The casting of the finer metals and alloys, as gold, silver, and German silver, is necessarily conducted on a smaller scale.

When the casting of an object is required, it is necessary, in the first place, to make a pattern. Suppose it to be a plain round iron pillar, such as is used for hanging a gate upon. A pattern of this is turned in some wood which can be readily made smooth on the surface, such as pine, and then varnished or painted so as to come freely out of the mould. This wooden pillar, or any similar pattern, is always made in at least two pieces, the division being lengthwise, for a reason which we shall presently see. The next step is to prepare the mould. The moulds used by the iron-founder are either of sand or loam, but more generally of fine sand. Proceeding with the preparation of the mould, the founder takes a moulding-box, which is composed of two open iron frames with cross-bars, the one fitting exactly on the other, by means of pins in the upper, dropping into holes in the lower frame. One-half of the box is first filled with damp sand, and the pattern laid upon it, a little dry *parting sand* being sprinkled on the surface. The upper half of the box is then put on, and sand firmly rammed all round the pattern. The box is then carefully opened, and, when the pattern is removed, its impression is left in the sand. The mould at this stage, however, is generally rough and broken. It is necessary, therefore, to give it a better finish, which is done by taking each half of the mould separately, repairing it with a small trowel, and re-introducing the corresponding half of the pattern till the impression is firm and perfect. Finally, the surface of the mould is coated with charcoal-dust, which gives a smooth surface to the future casting. These columns being made hollow, there is yet another matter to arrange before the casting can be made—namely, the *core*. In the instance before us, it would simply be a rod of iron, covered with straw and loam to whatever thickness the internal diameter of the column happened to require. The core of course occupies the centre of the mould.

The cast iron is melted with coke in a round fire-brick furnace, called a *cupola*, the heat being urged by means of a powerful blast, created by fanners revolving at a high speed. The molten metal is run from a tap at the bottom of the furnace into a malleable iron ladle, lined with clay, from which it is poured into the mould through holes called *runners* or *gates.* When the mould is newly filled, numerous jets of blue flame issue from as many small holes pierced in the sand. These perforations are necessary for the escape of air and other gases produced by the action of the hot metal on the mould. Care must also be taken not to have the mould too damp, otherwise steam is generated, which may cause holes in the casting, and even force part of the metal out of the mould. The casting remains covered up for a time, in order to cool slowly, and is then removed by breaking away the sand, and drawing out the core.

In the case of a fluted, or otherwise ornamented pillar, the pattern would require to be in at least four pieces instead of two, because it is only a plain pattern that will come out of the mould in halves without tearing away the sand. When a pattern is necessarily made in several pieces, it is drawn out of the mould bit by bit, to the right or left, as the case may be, and so parts from the sand without breaking it.

Suppose that a small ornamental vase was to surmount the pillar, the founder would prepare the pattern of this in a more elaborate manner. He would first mould it in wax or clay, from which a cast in plaster of Paris is made; from that, again, a cast is taken in an alloy of tin and lead, which, after being sharply chased, and divided into the required number of pieces, is used as a pattern to cast from. All ornamental patterns, such as figures, scrolls, leaves, enriched mouldings, and the like, are made in this way, whatever metal the ultimate casting is to be produced in.

Very large engine cylinders, pans, and such vessels, are cast in loam-moulds, which are built of brick, plastered with loam, then coated with coal-dust, and finally dried by means of a fire. This method is adopted with large plain objects, where a pattern would be expensive, and when few castings of one kind are required.

Iron moulds, coated with blacklead or plumbago, have recently been introduced for casting pipes into; they are greatly more expensive than any other kind, but they enable the founder to dispense with a pattern, as, when once made into the required form, they are not destroyed like moulds of sand or loam at each casting.

Bronze and brass are cast in moulds prepared with finer sand than that used for iron. Pewter and similar soft metallic alloys are cast in brass moulds. The type-founder, on the other hand, uses moulds of steel, which are now worked to a great extent by a machine.

The variety of articles produced by founding or casting are very numerous, among others we may mention cylinders, cisterns, paper-engines, beams, boilers, pumps, and the heavy parts of machinery generally, gates, railings, lamps, grates, fenders, cooking-vessels, and the like, in iron: cannon, many portions of machinery, and numerous ornamental objects, in brass: sculpture and other works of art in bronze and the more costly metals. One of the most remarkable castings yet executed for the requirements of modern engineering, was the cylinder of the hydraulic press used for raising the tubes of the Britannia Bridge. It measured 9 feet × 3 feet 6 inches, the metal being 10 inches thick, and weighed upwards of twenty tons. It remained red hot for three days, and it was seven days more before men could approach it to remove the sand. Sole plates for steam-hammers, and for other purposes, have been cast more than double this weight, but the same care was not required in their execution. In regard to sculpture, perhaps the most wonderful casting known is the colossal statue of Bavaria at Munich, finished in 1850, which stands 54 feet high, the face being equal to the height of a man. It took eight years to cast, and the cost of the bronze used was about £10,000.

FOUNDLING HOSPITALS, establishments in which children that have been abandoned by their parents and found by others, are nurtured at the public expense. Amongst the ancient nations, these institutions were not unknown, though as the law usually placed the power of life and death in the hands of the father, and permitted him to sell his children into slavery, it is to be feared that infanticide, as among eastern nations at the present day, was the usual mode of solving the difficulty which foundling hospitals are intended to meet. Desertion, however, and exposure as less atrocious, were still more frequent crimes; and to meet these, the reception and education of foundlings were enjoined on private persons, to whom they were assigned in property. When this means of support failed, they were protected by the state. The Egyptians and Thebans are praised by the classical historians for discouraging the exposure of infants. The practice of exposing infants probably prevailed even amongst the Germanic nations previous to the introduction of Christianity; and though Tacitus says that infanticide was forbidden, in Iceland, in particular, it is said to have reached a fearful height. From the period at which Christianity became the state religion of the Roman empire, a sensible change in the spirit of legislation on the subjects both of infanticide and exposure is apparent; and though the latter is spoken of by Gibbon as one of the most stubborn remnants of heathendom, it gradually gave way, and the Christian church, at a very early period, lent its encouragement to the establishment of foundling hospitals. So early as the 6th c., a species of foundling hospital is said to have existed at Treves. The bishop permitted the children to be deposited in a marble basin which stood before the cathedral, and gave them in charge to members of the church. But the first well-authenticated one is that of Milan, established in 787, probably in obedience to the 70th article of the Council of Nice, which enjoined that a house should be established in each town for the reception of children abandoned by their parents. It is probable, however, that foundling hospitals existed pretty extensively at an earlier period, as mention is made of them in the capitularies of the Frankish kings. In 1070, a foundling hospital was established in Montpellier; in 1200, in Eimbeck; in 1212, in Rome; in Florence, in 1317; in Nürnberg, in 1331; in Paris, in 1362; in Vienna, in 1380. In France, the utility of these establishments, which were the special labour of Vincent de Paul (q. v.), was early called in question; and letters-patent of Charles VII., in 1445, affirmed that 'many persons would make less difficulty in abandoning themselves to sin when they saw that they were not to have the charge of the upbringing of their infants.' In Germany, the system of foundling hospitals was soon abandoned, the duty of rearing the children being, as in England, imposed by law, first on the parents, then on more distant relatives, whom failing, on the parish, and last of all, on the state. The reproach made by Roman Catholic countries against this more natural arrangement—that it tends to promote infanticide—is said to have been in no degree established by statistical investigations. The revolutionary government of France not only adopted the system of foundling hospitals, as it had been handed down to it, but in 1790 declared all children found to be children of the state (*enfants de la patrie*). Nay, as a still further premium on immorality, it declared that every girl who should declare her pregnancy should receive a premium of 120 francs! The imperial government, in 1811, abolished this insane enactment, continuing, however, the arrangement by which the foundling hospitals had become government establishments, and the children, children of the state. The system is still adhered to in France, where foundling hospitals exist in most of the large towns to the number of about 141; in Spain, where the number is estimated at 70; and generally in the Roman Catholic countries of Europe; and figures are brought forward to prove that it has not exhibited what would seem to be its obvious tendency. The number of children deposited in the revolving cradle at the Hospital in Paris, in place of increasing, is said by the advocates of the system to have diminished in proportion to the population; but the statement is utterly denied by German and Protestant writers. The expense of rearing a child to the age of twelve in the Hospital at Paris is 952 francs 42 centimes, or a trifle less than £40. The moment that the child is received it is weighed, and if its weight be less than six pounds, it is considered that its chance to live is very small. It is then inscribed in a register, and a formal statement is drawn up of any name which may have been given along with it, or of any particular mark which it bears either on its person or otherwise; of the hour at which it was deposited, its sex, and its dress. It is then inspected by a medical man, and handed over to the nurses. At Paris, each child is committed to a special nurse, many of whom are retained on the premises, and paid 40 centimes a day. Other nurses are brought in from the country in carriages kept by the Hospital, which return conveying the children along with their new mothers. The children thus boarded out are inspected twice a year by local medical men appointed for the purpose; but the surveillance is too often negligent, and consequently the treatment of the children by no means such as to conduce to their health. The parents, and indeed the relations of the children, are permitted to reclaim them at any period, or they may be legally adopted by any French citizen who is in a condition to maintain them. Notwithstanding the precautions of which French writers boast, the mortality amongst these 'infants of the state' is very appalling. Their average life, it is said, does not exceed four years; 52 per cent. dying during the first year, and 78 per cent. during the first twelve years. Only 22 out of 100 foundlings thus reach the age of twelve, whereas in the general population 50 out of 100 live to twenty-one. As might naturally be supposed, those who do survive, and are ushered into the world without friends or means, constitute a large proportion of the thieves and prostitutes of the country. Of the male convicts and prisoners of France, 13 per cent. are foundlings, and female foundlings form one-fifth of the inmates of the public houses of prostitution. The question of the propriety of encouraging secrecy by the use of the turning-box, or of causing the parents openly to deposit the children in the hands of an officer, has been, and is still discussed with much keenness in France. The argument in favour of the turning-box is that by which the whole institution is defended, viz., that it tends to discourage infanticide, and statistics are said to be rather in favour of it in this point of view. But there are many other obvious considerations of morality and public policy to be taken into account, which would serve to counterbalance this advantage, even supposing it to be real. Many Protestant states have established foundling hospitals; and those of Moscow and St Petersburg are among the largest in the world.

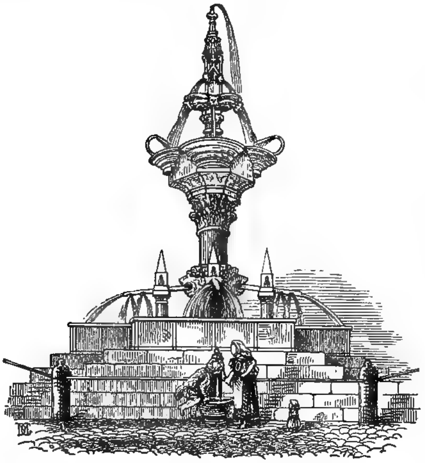
The Foundling Hospital in London was established by Captain Thomas Coram, a benevolent sailor, in 1739, as 'an hospital for exposed and deserted children.' The ground in Guildford Street was purchased from the Earl of Salisbury for £7000, and the architect of the hospital was Theodore Jacobson. The system of foundling hospitals never having been approved in England, the London hospital was changed in 1760 to what it now is—viz., an hospital for poor illegitimate children whose mothers are known. The committee, previous to admitting the child, must be satisfied of the previous good character and present necessity of the mother. The qualification for a governor is a donation of £50. The great Handel was one of the chief benefactors of the hospital. He endowed it with a magnificent organ, and frequently performed his oratorio of the *Messiah* in the chapel, which is still celebrated for its music. Though every attention is paid to the health and comfort of the children at the Foundling—to such an extent, indeed, as very often to unfit them for the hardships which many of them must encounter in after-life—we have been informed by the physician that they do not attain to the height of average English men and women. There are no foundling hospitals in the United States; but they exist in Mexico, and in almost all the states of South America.

FOUNTAIN, a basin or jet for the supply of fresh running water. There are fountains of every form and variety, from the simple spring with its natural basin, to the most elaborate and ornamental structure for the display or supply of water. In all ages, fountains have been considered as public monuments of the greatest importance; and where the source for their supply has not been provided by nature on the spot, immense labour and expenditure have often been incurred to make up for the deficiency. The splendid Aqueducts (q. v.) of the Romans are instances of the important light in which they regarded the fountains of their cities. Every Roman town had at least one aqueduct, the water from which was distributed to as many fountains as the population required.

Utility is the first object of a fountain, and although they are frequently made subjects of great display and magnificence, the finest fountains are those where the water is the greatest ornament. In the middle ages, fountains of great beauty and variety of form were built, but the useful nature of the structure was never lost sight of. Sometimes a spring was arched over for protection, with a beautiful vault, and a statue of the patron saint placed in a niche, with a basin below to contain the water. In towns where a number of persons might require to draw at one time, a large basin was erected, with a pillar in the centre, from which pipes radiated all round—each with its separate jet to supply the running water—while the basin was used for washing the pitchers. Many examples of this kind of fountain remain. On the following page is represented a fountain at Viterbo, in the Papal States, where there are many of the same description. The pillar is sometimes surmounted by a statue, or has one or more smaller basins, with ornamental streams and jets of water falling from tier to tier. A beautiful fountain of this nature existed in the royal palace at Linlithgow, and a copy of it has recently been erected in front of Holyrood Palace.

In modern times, the French have distinguished themselves by their magnificent fountains, those of Paris and Versailles being almost unrivalled. In

England, the fountains at Chatsworth (q. v.) and those at the Crystal Palace are among the finest, and are remarkable for the great height to which the water is thrown. Although Rome has lost four-fifths of the aqueducts which so lavishly supplied her with fresh water in the times of the Empire, she is still unsurpassed for the number, beauty, and utility of the public fountains which adorn her streets and places.



Fontana Grande, Viterbo.

Modern fountains are, for the most part, entirely ornamental. This arises from the modern mode of distributing water in pipes through the houses, making the street-fountains to a great extent useless. It is found, however, that our town populations—both man and beast—require some public supplies of water, and these are now largely supplied by the numerous drinking-fountains which are being constructed in all our principal towns.

FOUNTAIN. Water is represented heraldically by a round ball, having wavy stripes of blue and white, barways, called a fountain.

FOUQUÉ, Friedrich Heinrich Karl, Baron de la Motte, a modern German author, was grandson of the Prussian general of this name, distinguished in the Seven Years' War. Born at Brandenburg, 12th February 1777, F. served as Prussian officer in the campaigns of 1792 and 1813. The interval between these campaigns was devoted to literary pursuits in the country, and the rest of his life was spent alternately in Paris and on his estate at Nennhausen, and subsequently at Halle. He died in Berlin, 23d January 1843. F. appeared first under the name Pellegrin, as translator of Cervantes's *Numancia*, and author of some effusions in the spirit of Spanish poetry. But the Norse legends and old German poetry attracted him most strongly; this was evinced in numerous romances, in prose and verse, which picture the old life of medieval Europe. Among the best known of these are *Sigurd, der Schlangentödter* (1809)—the first work to which F. attached his real name—*Der Zauberring*, *Die Fahrten Thiodolf's*, and *Undine*. Successful in exhibiting many of the beauties of the romantic school, he is yet chargeable with all its extravagances. Straining too often after fantastically unnatural conceits, he seems fascinated by the antique life which he pictures, rather merely from its quaint contrast with modern manners, than as a form into which the life of actually living men had shaped itself in former times. He has himself edited a selection of his works (*Auserwählte Werke*, 12 Bde., Halle, 1841).—F.'s first wife, Karoline von Briest, is also known in Germany as a productive authoress.

FOUQUIER-TINVILLE, Antoine Quentin, the notorious public accuser in the French Revolution, was born in the village of Hérouelles, in the department of Aisne, in 1747. His early career was immoral, but insignificant. On the outbreak of the Revolution, he figured as one of the fiercest democrats. By Robespierre, he was appointed, first, a member, then director and public accuser, of the Revolutionary Tribunal. Without education, conscience, or sense of justice, he executed with brutal apathy the bloody orders of the Committee of Public Safety. In reference to this feature of his character, his countrymen say that 'he had no soul —not even that of a tiger, which at least pretends to be pleased with what it devours.' Incapable of friendship, or of anything even remotely allied to generosity, he systematically abandoned his successive coadjutors in their hour of need, and sent to the scaffold, without the slightest compunction, Bailly and Vergniaud, Danton and Hebert, Robespierre and St Just. He himself died by the guillotine, in a cowardly manner, 7th May 1795.

FOUR EVANGELISTS, part of a larger group of islands known as the *Twelve Apostles*, lie off the west entrance of the Strait of Magellan. They are about lat. 52° 34′ S., and long. 75° 5′ W. The eight other islands, with which they are classed as above, run about 15 miles further out into the Pacific.

FOUR LAKES, a chain of connected sheets of water in Wisconsin, United States, are fed chiefly by springs, and form, through their outlet, the Catfish, a north-eastern source of the Mississippi. They are navigable for steam-boats, and drain a beautiful country. Madison, the capital of the state, stands on the strip of land which separates the uppermost of the series from the next in order.

FOURCRO'YA, a genus of plants of the natural order *Amaryllideæ*, nearly allied to Agave (q. v.), but with stamens shorter than the corolla. The species are all tropical. The leaves of some—perhaps of all—of them yield a fibre similar to the Pita Flax obtained from those of species of *Agave*.

FOURIER, Jean Baptiste Joseph, Baron, a distinguished French mathematician, was born of a respectable family at Auxerre, 21st March 1768. He became a pupil, and at the age of 18, a professor, in the military school of his native place. He was afterwards removed to the normal school in Paris, and then to the Polytechnic, and accompanied General Bonaparte to Egypt. Besides performing political services on this occasion, he was secretary to the *Institut d'Egypte*, and an active contributor to the *Description de l'Egypte*, the masterly historical introduction to which is from his pen. On returning to France, he was made préfet of the department of Isère in 1802, an office which he held till 1815, and was created baron in 1808. As préfet, he succeeded in draining the marshes in Bourgoin, near Lyon, which had for centuries baffled all attempts. On the return of Napoleon from Elba, F. issued a royalist proclamation; notwithstanding which he was appointed by Napoleon préfet of the department of the Rhone, but was shortly after removed. He now took up his abode in Paris, and devoted himself exclusively to science. The Academy of Sciences, which in 1807 had crowned his essay on the propagation of heat through solid bodies, chose him a member in 1815, and afterwards secretary for life, conjointly with Cuvier. He died 16th May 1830.

His most famous work is the *Théorie Analytique* *de la Chaleur* (Par. 1822), in which he applies new methods of mathematical investigation. An allied subject is discussed in his *Mémoire sur les Temperatures du Globe Terrestre et des Espaces Planétaires* (Par. 1827). Besides heat, he occupied himself with the theory of equations, which received from him important improvements. His work, *Analyse des Equations Déterminées*, distinguished both for its substance and manner of exposition, was left unfinished, and was published after his death by Navier (Par. 1831).

FOURIER, François Marie Charles, a French Socialist, was born at Besançon, April 7, 1772. His father, a merchant, had him educated in an academy at Besançon for his own profession. He distinguished himself by his perseverance and success in study, and excelled in geography, mathematics, music, and the natural sciences. He left his studies with regret to enter upon the duties of a merchant's clerk, which he performed with zeal and integrity at Lyon, Rouen, Marseille, and Bordeaux. He also travelled in the interest of his employers, not only in France, but in Holland and Germany. In these journeys and residences, nothing escaped his observation; he noted climate, culture, population, public and private edifices, and remembered even the topography of villages, and the dimensions of buildings, with astonishing accuracy. His father died in 1781, leaving him about £5000, which he became possessed of in 1793, and invested in trade at Lyon. This was lost in the Revolution; and he was thrown into prison, and compelled to serve two years as a cavalry soldier. Discharged on account of illness, he obtained employment in a mercantile house at Marseille, where he was employed to superintend the destruction of an immense quantity of rice, held for higher prices, in the midst of a scarcity of food, until it had become unfit for consumption. This circumstance called his attention to the frauds and duplicities of commerce, and he devoted his spare time to the study of social problems, until he developed the system of Socialism to which his name is commonly given. This system is contained in several works, written and published under discouraging circumstances. In 1808, he published his *Théorie des Quatre Mouvements, et des Destinées Générales* (Theory of the Four Movements, and of the General Destinies of the Human Race). In 1822, he produced his *Traité d'Association Domestique Agricole* (Treatise on Domestic and Agricultural Association); in 1829, *Le Nouveau Monde Industriel et Sociétaire* (The New Industrial and Social World); in 1831, *Pièges et Charlatanisme des Deux Sectes Saint-Simon et Owen, promettant l'Association et Progrès* (Snares and Quackeries of the Two Sects of St Simonians and Owenites, promising Association and Progress); in 1835, *La Fausse Industrie, Morcelée, Repugnante, Mensongère, et l'Antidote, l'Industrie Naturelle, Combinée, Attrayante, Véridique, donnant Quadruple Produit* (False Industry, Fragmentary, Repulsive, and Lying, and the Antidote, a Natural, Combined, Attractive, and Truthful Industry, giving Quadruple Products). These works, written in the midst of commercial pursuits, and published at long intervals, by means of his small savings, found for many years few readers, and no disciples. Towards the close of his life, a small group of intellectual men accepted his views, and gathered round him, to learn the details of his social system from his own lips. He was unwearied in his efforts to interest men of power or capital, who could give his theories the test of practical realisation, and for many of the last years of his life waited patiently at a certain hour every day, expecting to be visited by such a patron. His less patient disciples probably hastened his death by immature and partial efforts at realisation. He died in Paris, October 8, 1837.

FOURIERISM, the Social System invented by Charles Fourier, is contained in his published works, in a large collection of unpublished MSS., and in the writings of Considerant, Lechevallier, Brisbane, and others of his disciples. It differs materially from the systems of Communism strictly so called, and all other social theories, and professes to be based upon natural laws, and capable of being carried out on mathematical principles, as fixed and certain as those of geometry, music, or colours. The earth and human society, Fourier taught, are in their crude and infantile stage. The period of the race will be 80,000 years, the latter portion of which will be its declining phase, as the present is its ascending. The middle term will be a long period of maturity, prosperity, and happiness. What we call civilisation, Fourier considers a false and imperfect condition, with poverty, crime, ignorance, idleness, repugnant toil, disease, wasting wars, general antagonism, oppression, and misery. He believed that Association would produce general riches, honesty, attractive and varied industry, health, peace, and universal happiness. Considering attractions and repulsions the governing forces of all nature, and that God has distributed them for the happiness of all His creatures, he held that 'attractions are proportional to destinies,' or that the desires or passions of men, their aptitudes and inclinations, if they could have free scope, would infallibly produce the highest condition and greatest happiness of which they are capable. He believed in a universal harmony, flowing from and centering in God, the author of all harmonies, and that there is therefore a principle of 'universal analogy.' Seeing that all things, from suns and planets to atoms, range themselves in groups and series, according to certain fixed laws of attraction and repulsion, he laboured to discover the kind of human society that must eventually form itself in obedience to those laws. This is the Association or Phalanstery, which is to consist of 400 families or 1800 persons, which number he found included the whole circle of human capacities. These should live in one immense edifice, in the centre of a large and highly cultivated domain, and furnished with workshops, studios, and all the appliances of industry and art, as well as all the sources of amusement and pleasure. When the earth is covered with palaces of attractive industry, the associations will also unite in groups and series, under a unitary government. There will be but one language and one government, and the only armies will be the great industrial armies, which will drain swamps, irrigate deserts, plant forests, and effect the amelioration of climates. The system of Fourier does not propose to destroy, but rather to conserve property, position, and hereditary rights, nor does it war directly with morals or religion. The property of the Association is to be held in shares, and the whole product of the industrial and artistic groups is to be divided into twelve parts, of which five parts are due to labour, four to capital, and three to talent. The apartments are to be of various prices, and the styles of living to vary in luxury and cost; but the poorest person in the Association is not only to be secure of comfort, but his minimum of enjoyments will be greater than the present social arrangements can give to princes and millionaires; while these will have opened to them pleasures of which they can now scarcely have a conception. The economics of the large scale in the Phalanstery reduce by two-thirds the expenses of living, while an attractive and scientific industry would quadruple the products of civilisation.

The passions of the human soul to which the system of Fourier would give full scope, he described as the five sensitive—sight, hearing, taste, smell, touch; four affective—friendship, love, ambition, and paternity; three distributive—the emulative, alternating, and composite. In these he found the springs of industry and true society. Emulation, the desire of success, honours, rewards, is the great stimulant to exertion; alternation of employments makes work a recreation; and the composite passion requires combinations of charm and enjoyment which only Association can give. Many attempts have been made—a few in France, and more in America—to carry the ideas of Fourier into practical realisation; but they have all been on a small scale, and with inadequate means, and have resulted in failure. Whatever we may think of the system, in its principles or its theoretical development, nothing can be founded upon the failure of such experiments. It remains to be proved whether human nature, in its present state, is capable of carrying out successfully a social system so widely varying from all existing social conditions. The moral objections to Fourierism are, that it appears to make luxury, ambition, and sensual delights the end of existence—the incentives and rewards to all exertions; and that the passions of men, when left in the perfect freedom which this system requires, would lead to ruinous demoralisations. The answer is, that 'attractions are proportional to destinies,' and that these excesses belong to the present state, and are incident to the poverty and repressions of civilisation, but could not exist in a true society; which raises the question—What is a true society? Whatever may be thought of the practicability of the system, its study in the works of Fourier is full of suggestions to the student in sociology.

FOURNI ISLANDS (anc. *Corássiæ* or *Córseae*), a group of about 20 small islands in the Grecian Archipelago, between Nicaria and Samos, on the eastern coast of Asiatic Turkey. The largest of these islets is about five miles in circuit.

FOWEY, or **FOY**, a borough town on the south coast of Cornwall, on the right bank of the river Fowey, 25 miles south-south-west of Launceston. It is sheltered by hills, and lies amid picturesque scenery, rude sea-cliffs, and promontories. The harbour admits large vessels at all states of the tide, and its entrance is guarded by three forts. The chief business is catching and curing pilchards, which, with 'china-stone' and iron-ore, form the main exports. F. sent 47 ships and 770 men to the siege of Calais by Edward III. in 1347. It was burned by the French in 1457, and taken by Fairfax in 1646. Pop. (1861) 1450.

FOWL (Ger. *vogel;* allied to the Lat. root *fug-*, to flee, and perhaps to *wag-*), a word originally synonymous with *bird,* and still employed in that signification, but also in a much more restricted sense, as the designation of the genus of Birds (*Gallus*) to which the common Domestic Fowl (*G. domesticus*) belongs. This genus gives its name to the important order of *Gallinaceous Birds,* also called, from their well-known habit of scraping the earth in search of food, *Rasores* (Lat. Scrapers); and is included in the family *Phasianidæ,* with pheasants, tragopans, &c. The general form, and the characters of the bill, feet, &c., agree with those of the pheasants; but the crown of the head is generally naked, and furnished with a fleshy *comb,* the base of the lower mandibles also bearing fleshy lobes or *wattles,* characters which are most conspicuous in the males; and the tail is very different from that of the pheasants, and, indeed, very singularly formed, being composed of fourteen feathers in two nearly vertical planes, or as if a horizontal tail were folded together, so as to make a sharp angle at top, the two middle feathers being the uppermost, and in the males elongated beyond the rest, and gracefully arched. The tail-coverts of the male are also very ample, and the feathers of the back of the head and of the neck are either elongated and loosely webbed, forming the *hackles,* so much valued by anglers for dressing artificial flies, or are otherwise modified to serve the purpose of adornment; characters which are also sometimes exhibited in a very inferior degree in the female sex. The legs of the male are armed with spurs, as in the pheasants, of which much use is made in the combats of these birds among themselves, all of them being very pugnacious. They are all polygamous, and unable to endure the presence of a rival. They are all natives of the East Indies and of the Malayan Archipelago. From what country, and at what period the Domestic Fowl was originally introduced into Europe, is uncertain. The remains of Egyptian antiquity carry us back to a period when it was apparently unknown in Egypt, and there is no distinct allusion to it in the Old Testament; but it seems to have been common in the south of Europe from the earliest ages of European civilisation. The cock was sacred to Apollo, to Mercury, to Mars, and to Æsculapius. It was figured on Grecian and Roman coins and gems; it was highly valued for its courage and pugnacity, and the sport of cock-fighting was a favourite one both with the Greeks and the Romans, as it is amongst the Chinese, the Malays, and many other nations at the present day, and in former times was amongst all classes of society even in Britain. See COCK-FIGHTING. The Domestic Fowl appears to have been known to the ancient Britons before the Roman invasion; and when the South Sea Islands were first visited by Europeans, it was found there in the same domesticated state, and there also cock-fighting was found to be a fashionable amusement of the savage natives. The native country of the Domestic Fowl is not certainly known, nor is it certain what the species is in its original state. The ancient Greeks sometimes called it the *Persian Bird,* and hence it has been supposed to be a native of Persia; but there is nothing else to support this opinion, and it seems likely enough that this appellation may at most only indicate its introduction into Greece from Persia. The Jungle Fowl of India, the first species of *Gallus* known in its wild state to naturalists, was for some time supposed to be the origin of the Domestic Fowl, but to this opinion there are strong objections in the very peculiar character of some of the feathers which distinguish the Jungle Fowl, and of which no trace ever appears in the Domestic Fowl. More recently, the Bankiva Fowl and other species have been discovered in Java and other islands of the Eastern Archipelago, more nearly resembling the Domestic Fowl, and the distribution of the latter through the islands of the Pacific Ocean is favourable to the belief that it derived its origin from that region; but still the identification of the species remains difficult, and some naturalists incline to the opinion that the Domestic Fowl may be derived from intermixture of distinct wild races.

The BANKIVA FOWL (*G. Bankiva*), native of Java, is extremely similar to some of the domestic varieties; indeed, Sir William Jardine says: 'Many Bantams so nearly resemble this bird, that there would be great difficulty in making a distinction. The comb is large and lobed, or dentelated; the colours are brilliant, steel-blue and chestnut, black and yellowish brown, the hackles abundant and golden orange; some parts of the plumage exhibiting a very fine play of colours. A very similar species, or a variety of the same, but rather larger, is found in some parts of continental India.' Very similar also is the Bronzed Fowl (*G. æneus*), found in Sumatra, a bird resplendent in metallic green, purple, and lake; but of which the comb has the upper margin unbroken; the wattles are combined into one attached to the centre of the throat; and the neck feathers do not assume the *hackle* character, which appears in the neighbourhood of the tail alone. These peculiarities also belong to the Fork-tailed Fowl (*G. furcatus* or *Javanicus*), a species very abundant in the jungles of Java, and often to be seen on their outskirts, nearly two feet in length from the tip of the bill to the extremity of the tail. A still larger species—if, indeed, these are not rather varieties than species—is the Gigantic Fowl, Jago Fowl, or Kulm Fowl (*G. giganteus*) of Sumatra, with double wattle under the throat, abundant hackles on the head, neck, and upper part of the back, green and reddish yellow the principal colours, and the height considerably more than two feet.—The Jungle Fowl (*G. Sonneratii*), abundant in the higher wooded districts of India, where it is much sought after by European sportsmen, is about equal in size to an ordinary Domestic Fowl, but is more slender and graceful in its form; the comb of the male is large, and its margin broken; the colours are rich and beautiful; but a remarkable peculiarity is exhibited in the hackle feathers, which are terminated by flat horny plates of a golden orange colour, into which the shaft expands, or the shaft thickening and terminating abruptly gives rise to a battledore-like stem and disc, in substance like the tips of some of the feathers of the wax-wing.

Of the Domestic Fowl there are some very curious varieties, of which some naturalists have attempted to constitute distinct species, particularly the Negro Fowl (*G. morio*), rarely seen in British poultry-yards, remarkable for the black colour of the *periosteum* (the outer covering of the bones), and the dull purple of the comb, wattles, and skin; the Silky Fowl (*G. lanatus*), very common in China and Japan, with periosteum and skin of the same dark colour as the Negro Fowl, but the flesh remarkably white, the comb and wattles purple, the feathers with webs disunited and silky; and the Friesland (probably a mistake for Frizzled) Fowl (*G. crispus*), which has all the feathers standing nearly at right angles to the body.

There are also varieties of the Domestic Fowl remarkable for what may be considered monstrosities—as the want of a tail and of some of the last vertebræ, the presence of an additional spur on each leg (Dorkings, &c.), superabundant combs, crests or tufts of hackle feathers instead of combs, tufts of feathers springing from the lower jaw (the Siberian Fowl), &c.; and there are many varieties esteemed by keepers of poultry, of which the most important are—1. The Game Fowl, with erect and slender body and shewy colours, valued also for the delicacy of the flesh and of the eggs, although the eggs are rather small. It is this breed which is used for cock-fighting; and so excessive is the pugnacity which characterises it, that broods scarcely feathered are occasionally found to have reduced themselves to utter blindness by their combats. Some poultry-keepers think it good to have a game-cock in their poultry-yard, on account of the improvement of the quality of the fowls sent to the table; but it is almost needless to say, he must, like the prototype of Robinson Crusoe, be sole monarch of all he surveys. 2. The Dorking Fowl, so named from Dorking, in Surrey, where it has long been bred in great numbers for the London market—a breed characterised by an additional spur on each leg; often of a white colour, with short legs; one of the most useful of all breeds, both for excellence of flesh and for abundance of eggs. 3. The Polish Fowl, black, with a white tuft, a breed very extensively reared in France, Egypt, &c., little inclined to incubation, but valued for an almost uninterrupted laying of eggs. 4. The Spanish Fowl, very similar to the Polish, but larger, and laying larger eggs, on account of which it is now much valued, and very common in Britain; black, with white cheeks and large red comb. 5. The Malay Fowl, tall and handsome, very pugnacious, but little esteemed. 6. The Hamburg, of very beautiful plumage, and much valued for the quality both of flesh and eggs, as also for extreme productiveness of eggs. 7. The Cochin China Fowl, a large, tall, ungraceful variety, with small tail and wings, for which there was a great rage among poultry-fanciers when it was newly introduced into Britain, and particularly about the year 1852, and which is valuable chiefly on account of its fecundity, eggs being laid even during winter, and the hens incubating frequently. 8. The Bantam Fowl (q. v.), a diminutive variety, rather curious than useful.—Of most of these there are many sub-varieties and *fancy breeds*—gold-pencilled, silver-pencilled, &c. The common Dunghill Fowl is apparently a breed produced by the intermixture of others, and perhaps chiefly a less graceful, less spirited, and less pugnacious race of the Game Fowl.

Concerning the treatment of the Domestic Fowl in the poultry-yard, the diseases to which it is liable, &c., see Poultry. The artificial hatching of eggs is noticed in the article Incubation. Concerning the eggs of the Domestic Fowl as an article of commerce, &c., see Egg.

The readiness with which the Domestic Fowl can be induced to go on laying eggs far beyond the number proper for a brood, is not nearly equalled in the case of any other domesticated bird, and greatly enhances the usefulness of this species to mankind, whether the eggs are used for food, or, by artificial hatching, made to produce chickens, as is common in Egypt and some other countries. Few hens incubate oftener than once a year, but some lay in the course of a year even more than 200 eggs.

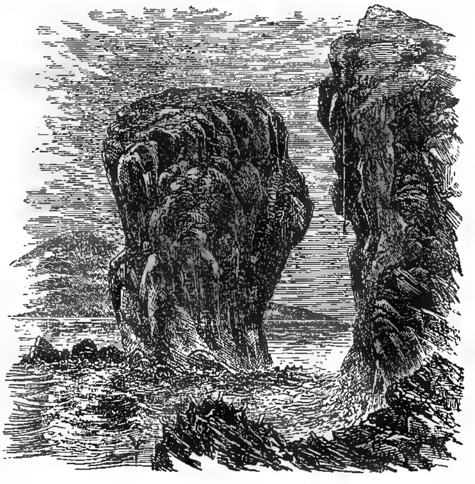
FOWLER'S SOLUTION. See Arsenic.

FOWLING—the killing or taking of birds for the sake of their flesh, feathers, &c.—is very variously practised in different parts of the world. In some places, it is one of the principal employments of the people, who greatly depend on it for their subsistence, and prosecute it with the greatest toil and danger; elsewhere, it is in some of its forms a recreation, for the sake of which much expense is incurred by the opulent. The modes in which it is practised depend partly on the habits of different kinds of birds, and partly on the progress of civilisation and the arts. The peculiar habits of some birds render it very easy to take or kill them. Nets are much used in the capture of many kinds of birds, particularly of small birds intended for the table: birdlime is employed for the same purpose, and birds are taken by means of it in greatest numbers near their drinking-places, particularly in hot and dry weather; gins, springes, and traps of various kinds are also employed.

The numerous kinds of ducks, geese, and other *Anatidæ*, are, in an economical point of view, among the most important of birds; and the methods employed for their capture are very various and interesting. These, however, we reserve for a separate article, Wildfowl; and refraining also here from any notice of the amusements of the sportsman, we shall proceed to describe the methods adopted in *Rock-fowling*, on which the inhabitants of many northern coasts and islands in a great measure depend for their means of subsistence. Of all kinds of fowling, it is by far the most adventurous. The objects of pursuit are gannets or solan geese, gulls, terns, guillemots, and other sea-birds, which frequent the most lofty precipices, and breed on their shelves and ledges. The flesh, even of the best of them, is generally coarse, and of a fishy taste, yet it forms great part of the food of the poor people, both fresh, and salted for winter provisions. The flesh of the young is more tender and pleasant than that of adult birds. The eggs of some species are sought after by the same perilous means as the birds themselves. The feathers, too, are an article of commerce. The people of St Kilda pay part of their rent in feathers; and the rocks of that island are apportioned among its inhabitants as exactly as its soil. Almost every man in the island is a cragsman or rock-fowler, which is pretty nearly the case also in many other northern isles. The multitudes of sea-fowl around many of the rocky northern coasts is prodigious, resembling at a distance—as may be seen at the Bass Rock in the Firth of Forth—the bees around a busy hive. Uninhabited islets are annually visited by fowlers, as Borrera by the people of St Kilda; and the ‘stacks,’ or high insular rocks near the shore, are often extremely productive. These are, of course, reached by means of a boat; and whilst landing is often both difficult and dangerous, the climbing of the precipice is still more so. The Norwegian fowlers, or ‘bird-men,’ carry on such expeditions with a *bird-pole* or *fowling-staff*, about five or six yards long, and a rope of several fathoms. The bird-pole has an iron hook at one end: it has also a flat head; and by means of it the fowler is pushed and guided by his comrades below as he ascends a very steep or precipitous cliff; by means of it, also, he strikes down or draws in birds. The rope is used to fasten two fowlers together, being attached to the waist of each: they aid one another in climbing, pushing, and drawing one another up the rocks, the safety of the one often depending on the strength and courage of the other. The bird-pole is also used with a small net attached to it, in the capture of birds that are flying around. The Norwegian fowlers sometimes remain for days on ledges where birds are abundant, sleeping in holes or clefts, and having food let down to them by a rope from above.

Still more perilous, if possible, is the mode of fowling practised where the precipices cannot be scaled. The fowler is let down by a rope, and hangs in mid-air, often at an elevation of several hundred feet, above rough rocks or roaring waves; and by means of his feet or of a pole, throws himself out to such a distance from the face of the rock as to obtain a view of all its ledges and crannies, to which, with astonishing coolness and dexterity, he directs his course, often also catching the birds that fly near him in the air. Speaking of the fowlers of St Kilda, Wilson (*Voyage Round the Coasts of Scotland and the Isles*) remarks: ‘How one man (for such is the case), himself standing with the points of his toes upon the verge of a precipice many hundred feet deep, can, with such secure and unerring strength, sustain the entire weight of another man bounding from point to point below him with irregular and frequent springs, is what a stranger cannot understand. . . . . But we ascertained that there is never more than a single man above supporting the weight of the one below. Each of these couples has two ropes. The rope which the upper man holds in his hands is fastened round the body and beneath the arms of him who descends, while another rope is pressed by the feet of the upper man, and is held in the hand of the lower.’ The second rope is for giving signals, and for sending up birds when captured. The principal rope is made of raw cow-hide, cut into thongs and twisted; it is so durable as to last for two generations, and is bequeathed as valuable property by father to son. Other materials, however, are used elsewhere; and the practice differs also as to the number of comrades holding the rope above. In the Faroe Isles, where some of the precipices are 1400 feet in height, the rope is usually held by a number of men. In some of the Scottish islands, fowlers have been adventurous enough to descend the cliffs unaided, fastening the rope for themselves to a stake driven into the ground above. The fowlers of the Faroe Isles sometimes use the pole with net at the end, whilst suspended in the air. It is not unusual for the fowler, when he finds a ledge or recess in the precipice abounding in birds, to disengage himself from the rope whilst he pursues his labours there; but when the precipice overhangs above, he is exposed to a great danger of the rope's escaping from his reach. A case is on record in which the only resource of the fowler was to make a desperate spring and catch the rope, which hung a few feet before him in the air; and this he succeeded in doing.

The cut represents rock-fowling at the Holm of Noss, a precipitous insular rock, separated from Noss, one of the Shetland Isles, by a chasm of 65 feet wide, and 160 feet deep, over which ropes have been stretched, so that a *cradle* or sparred box can be made to pass along them, affording access to the grassy summit of the Holm, where a few sheep now feed, and where innumerable sea-birds make their nests.



The Holm of Noss, Shetland.

FOWLS OF WARREN. Lord Coke says they are ‘the partridge, quail, rail, &c.,’ ‘pheasant, woodcock, &c.,’ and the ‘mallard, heron, &c.,’ leaving the etcæteras without explanation (*Co. Litt.* 233). Manwood, again, lays it down that there are only two fowls of warren, the pheasant and the partridge (Manw. 95). In the Duke of Devonshire *v.* Lodge (7 B. and C. 36), it was decided that grouse are not birds of warren.

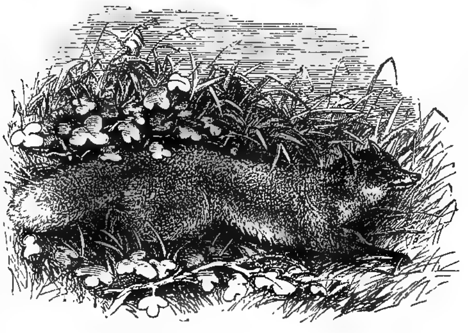
FOX, Charles James, a celebrated Whig statesman, was the second son of Henry Fox, first Lord Holland, by Lady Georgiana Carolina, eldest daughter of the Duke of Richmond. He was born, according to Lord John Russell's memoir, on the 24th January 1749 (N.S.), and was educated at Eton and Oxford, spending his vacations on the continent in the gayest and wittiest circles of the French capital, and visiting Switzerland and Italy. Notwithstanding the irregular life which he led even as a school-boy, he was very distinguished for ability both at school and college; and so high was his father's opinion of his talents, that at the age of nineteen he had him brought into parliament as member for the borough of Midhurst, a step to which he is said to have been further incited by the fact, that, even at this early age, F.'s energies had found an outlet in gambling and various other forms of dissipation. His precocity in vice, as well as in intellectual development, is said to have been the result of the injudicious fondness of his very unprincipled but very gifted father. Till he attained his majority, F. prudently kept silent in the House, but immediately thereafter he appeared as a supporter of the administration of Lord North, and was rewarded with the office of one of the lords of the Admiralty. In 1772, he resigned that office, and the following year was named a commissioner of the Treasury. From that post he was dismissed, in consequence of a quarrel with Lord North, and passed over to the ranks of the opposition. During the whole course of the American war, he was the most formidable opponent of the coercive measures which were adopted by the government, and the most powerful advocate of the claims of the colonists; acting, to this extent at least, in accordance with the views which for many years before had been urged upon the country by the great Lord Chatham, the father of his future rival Mr Pitt. The difference between them was, that whereas Lord Chatham urged conciliation, in order to preserve the connection between the two countries, F. foresaw and foretold the necessity and the advantages of complete separation. In 1782, on the downfall of Lord North, F. was appointed one of the secretaries of state, which office he held till the death of the Marquis of Rockingham, when he was succeeded by the Earl of Shelburne, afterwards Marquis of Lansdowne. On the dissolution of the Shelburne administration, the North and Fox coalition was formed, and F. resumed his former office; but the rejection of his India Bill by the House of Lords soon after led to the resignation of his government. It was now that Mr Pitt came into power, and that the long and famous contest between him and F., who occupied the position of leader of the opposition, commenced. In 1788, he enjoyed a short respite from his public labours. Accompanied by his wife, he visited the continent, and having spent a few days at Lausanne, in the company of Gibbon, who was there engaged in writing his famous history, he set out for Italy. The sudden illness of the king, however, and the necessity of constituting a regency, rendered it undesirable that he should be longer absent from England, and he hastened back to his post. The regency, the trial of Warren Hastings, the French Revolution, and the events which followed it, gave ample scope to the talents and energies of F., and on all occasions he employed his influence to modify, if not to counteract, the policy of his great rival. He was a strenuous opponent of the war with France, and an advocate of those non-intervention views which find greater favour in our day than they did in his. After the death of Pitt, F. was recalled to office, and endeavoured to realise his doctrines by setting on foot negotiations for a peace with France, the results of which he did not live to witness. He died on the 13th September 1806, in his 59th year. In private life, Mr F. was a genial companion, kindly and sincere in the closer relations of friendship, whilst his conduct to those to whom he was opposed in public was generous, and free from every trace of malignity or enmity. Lord John Russell, in the preface to his *Memorials and Correspondence*, speaks of the singular candour, boldness, simplicity, and kindness of his character; and of his oratorical powers it is enough to record, that Burke called him 'the greatest debater the world ever saw,' and Sir James Mackintosh, 'the most Demosthenian speaker since Demosthenes.' His remains were interred in Westminster Abbey, so near to those of Pitt, as to suggest to Sir Walter Scott the well-known couplet—

> Shed upon Fox's grave the tear,
> 'Twill trickle to his rival's bier.

FOX, George, the originator of the Society of Friends (q. v.), commonly called Quakers, was born at Drayton, in Leicestershire, in 1624, and at an early age was employed in keeping sheep. Subsequently, he was apprenticed to a country shoemaker; but when about 19 years of age, his religious impressions produced such a strong conviction in him, that he believed himself to be the subject of a special Divine call; and abandoning his usual avocations, wandered solitarily through the country, dressed merely in a leathern doublet of his own making, and absorbed in spiritual reveries. After some time, his friends induced him to return home, but F. stayed with them only for a short period, and finally adopted the career of an itinerant religious reformer. About 1646, he left off attending church for divine worship, but did not scruple to interrupt the services when conducted by 'professors,' i. e. formalists, or persons whom he believed not to be genuine Christians. His first efforts at proselytism were made at Manchester in 1648. The excitement caused was very great, and, in consequence, F. was imprisoned for some time as a disturber of the peace. It may be proper to mention here, that his leading doctrines or convictions were the futility of learning for the work of the ministry, the presence of Christ in the heart as the 'inner light,' superseding all other lights, and the necessity of trying men's opinions and religions by the Holy Spirit, and not by the Scriptures. F. next travelled through various of the midland counties, Derby, Leicester, and Northampton, exhorting the people in public places to forsake all vicious practices, drunkenness, swearing, &c., and to cultivate the Christian graces. He had a winning manner, resulting from his extreme earnestness and simplicity of purpose, and made many converts. His followers were first contemptuously called 'Quakers' at Derby, in 1650, by Justice Bennet, for what reason is not exactly known, but it may be conjectured that it possibly arose from the agitation exhibited in their speech when they believed themselves 'moved by the Holy Ghost.' In 1655, F. was brought to London, and examined before Cromwell, who quickly saw that there was nothing in Quakerism to excite his apprehensions, and pronounced the doctrines and the character of its founder to be irreproachable. Nevertheless, for some years after this, F. had a hard struggle with his Puritan antagonists. In an age of dogmatism and fanaticism, it was not to be expected that the half-mystical spiritualities and grotesque practical crotchets of the Leicestershire shoemaker could meet with any official toleration. F. was constantly vilified and frequently imprisoned by country magistrates. In 1669, he married the widow of Judge Fell. He then went to America, where he spent two years in propagating his views with much success. On his return to England in 1673, he was imprisoned for some time in Worcester jail, under the charge of having 'held a meeting from all parts of the nation for terrifying the king's subjects.' On his release, he visited Holland, and afterwards Hamburg, Holstein, and Danzig, always endeavouring to persuade men to listen to the voice of Christ within them. He died in London, January 13, 1691. F. was not a man of broad and philosophic genius; he did not enrich the world with the multitude of his thoughts; in fact, there is a conspicuous poverty of intellect and sentiment manifested in his writings, but (as often happens in the case of a mystic) the earnestness and clearness with which, in the opinion of many, one great truth of Christianity was realised, imparted a power and efficacy to his words that genius itself might envy. His doctrine of the universal 'inner light'—defended in a more learned fashion by Barclay (q. v.) in his *Apology for the Quakers*—may be regarded as a protest against the narrow or at least excessive 'scripturalism' of his age, but his understanding was not sufficiently clear and strong to guide him safely in all the consequences which he ventured to deduce from it. Hence have sprung most of the *niaiseries* of Quakerism. His writings were collected and published in 3 vols., 1694—1706. An edition in 8 vols. has been published at Philadelphia, United States.—Compare Sewel's *History of the Quakers;* Neal's *Puritans;* Marsh's *Life of Fox* (1848); and Janney's *Life of Fox, with Dissertations,* &c. (Phila. 1853).

FOX, William Johnson, orator and political writer, the son of a small Suffolk farmer, who afterwards settled as a weaver at Norwich, was born in 1786. He gave early promise of talent, and was sent to Homerton College, to be trained for the ministry of the Independents. He subsequently seceded to Unitarianism, but ultimately shaking off all allegiance to existing Christian churches, he delivered a series of prelections at his chapel in South Place, Finsbury, which marked him out as the leader and organ of English rationalism. When the Anti-corn-law League enlisted the ablest platform orators of the day in the service of free trade, his bold and impassioned rhetoric greatly contributed to arouse and intensify public feeling. M. Guizot quotes his speeches as the most finished examples of oratory which the great conflict produced. Their effect upon the vast metropolitan audiences to which they were addressed was electric. F. also contributed by his pen to the success of free trade, and his *Letters of a Norwich Weaver Boy* were largely quoted and read. After the abolition of the Corn Laws, he was invited to stand for Oldham, which borough he has continued to represent, with a brief interval, since 1847. Like most men who enter the House of Commons late in life, F. did not altogether realise the oratorical promise of his platform and pulpit career. His best parliamentary speeches were upon the education of the people. As a politician, he has been a consistent member of the advanced Liberal party. A succession of illnesses, of late years, has interfered with his attendance in parliament. He was among the earliest contributors to the *Westminster Review*, edited for many years the *Monthly Repository*, and has largely contributed to various other organs of public opinion. His *Lectures, chiefly addressed to the Working-Classes*, have been published in 3 vols. He is the author of a philosophical dissertation on *Religious Ideas*, and other theological works.

FOX (*Vulpes*), a genus of *Canidæ* (q. v.), particularly distinguished from dogs, wolves, jackals, &c., by the pupils of the eyes contracting vertically, and in the form of the section of a lens, not circularly. This takes place whenever the eyes are turned to a strong light, and foxes are all nocturnal animals. Foxes are also generally of lower stature in proportion to their length than the other *Canidæ;* they have a roundish head, with a very pointed muzzle, short triangular ears, slender limbs, and a bushy tail. They dig burrows for themselves in the earth, or take possession of holes already existing. They are famous for their cunning, which they exhibit both in their artifices for obtaining prey, and for escaping from danger. They feed on small quadrupeds, birds, eggs, &c.; some of them, however, also partly on fruits and other vegetable substances.—The Common Fox (*V. vulgaris*), a native of most parts of Europe, is the only British species, and is still pretty abundant in most parts of the country, although from many parts it would probably have been extirpated ere now, unless it had been in some measure protected with a view to the sport of fox-hunting. The common fox is reddish brown above, white beneath; the outside of the ears black, a black line extending from the inner angle of the eye to the mouth; the legs mostly black, the end of the tail generally white, although specimens sometimes occur in which it is gray, or even black. There are at least three varieties known in Britain, pretty well marked by difference of size and form—the *Greyhound Fox* being more slender and longer-limbed, and the *Cur Fox*—frequent in upland moorish districts—being smaller than the common variety. Other varieties occur in the north of Europe. The fox has a gland under the tail, which secretes a very fetid substance, communicating to the whole animal its well-known smell. It breeds once in a year, having usually four, five, or six young ones in a litter. Its usual voice is a kind of yelp. Its senses of sight, hearing, and smelling are very acute. Innumerable anecdotes are on record illustrative of its cunning. The difficulty of setting traps so that they shall not be detected and avoided by it, is well known. Foxes are said to have been observed approaching water-fowl by swimming slowly with a turf in the mouth, so as to remain concealed. A most trustworthy person assured the writer of this article, that he saw a fox approach a group of hares that were feeding in a field, with a slow, limping motion, and having his head down as if eating clover, till he was near enough, by a sudden rush, to secure very different food. Foxes captured in hen-roosts have often been known to simulate death, and to submit to being dragged about and very roughly treated without a sign of life, till an opportunity of escape presented itself. When


The Common Fox (*Vulpes vulgaris*).

they are driven to their holes, and these are surrounded with traps, they not unfrequently shew such a just appreciation of the danger, that they will endure starvation for days and even weeks rather than come out. Even when taken young, the common fox can hardly be tamed; and very few instances are on record of its shewing even a little of that attachment to man of which so many animals are capable, and for which the dog is so remarkable. The improbability of any of the domestic races of dog being at all derived from the fox, is noticed in the article DOG. The French *renard* appears in English in *reynard*, the familiar appellation of the fox.—The south of Europe produces foxes of smaller size than the common fox, having the fur of the belly black, regarded by some as a mere variety, by others as a distinct species (*V. melanogaster*). They are less carnivorous, and to them some of the allusions and fables relate—as of the fox and grapes, &c.—which do not accord well with the habits of the foxes of Britain and of Northern Europe.—The Himalaya mountains produce a species of fox (*V. Himalaicus*) very similar to the common fox, but of superior size and brilliancy of colours. The fur is rich and fine.—The BLACK FOX of Northern Asia is also very similar to the common fox, but is entirely of a velvety black colour, except the tip of the tail, which is white; its fur is greatly esteemed, brings a high price, and forms an article of export from Kamtchatka to China.—The COAL FOX (*V. alopex*) of some parts of Europe, as Switzerland and Bavaria, is by some naturalists regarded as distinct from the common fox. It is of inferior size, more timid, and less troublesome; the tip of the tail is black.—North America has several species of fox, of which the RED FOX (*V. fulvus*) very nearly resembles the common fox of Europe, but is of rather larger size, has a shorter muzzle, eyes nearer each other, and a more copiously bushy tail. Its fur is also longer, finer, more brilliantly coloured, and much more valuable, forming a considerable article of export from the fur countries; in which, as well as in Canada, and in the northern parts of the United States, this species is abundant. The CROSS FOX is a variety of it, distinguished by a longitudinal dark band along the back, crossed by a transverse band over the shoulders. The burrow of this fox 'at first inclines downwards for four or five feet at an angle of about twenty-five degrees, it then inclines upwards a little, which is a security against inundations, and is continued at a depth of about three or four feet from the surface, until it reaches a point where it is divided into two or three galleries.' Great numbers of these foxes are annually tracked to their burrows, and digged or smoked out of them by American farmers.—The GRAY FOX (*V. Virginianus*) is the most abundant species of the southern states, extending, however, as far north as Canada, where it is rare. It is of a gray colour, varied with black, is about the size of the common fox, but not so bold, and sometimes eats vegetable substances, such as ears of maize. The gray fox exhibits not a little of that cunning for which the common fox is celebrated, and when pursued by hunters and hounds, has been known to escape by getting upon the rail of a fence and running along it for some distance, so that the scent was lost. This was on one occasion done on the newly-laid rail of a railroad elevated above a swamp. It is not unfrequent for the gray fox, when hard pressed, to take refuge in a tree, particularly if one which has somewhat fallen from the perpendicular presents itself.—There are a number of other species of fox, Asiatic, African, and American; but the most deserving of notice is the ARCTIC FOX (*V. lagopus*), which inhabits the most northern parts of Europe, Asia, and America. It is very plentiful in Iceland, feeding much on ptarmigans, and sometimes on young lambs. Great numbers are found on the shores of Hudson's Bay, particularly during winter, and they have been supposed to migrate thither from still more northern regions; but it has been ascertained that this animal spends the winter even in the most northern regions that have ever been visited by man, braving the cold of Melville Island and Banks's Land, and finding abundance of food in the hares, marmots, ptarmigans, and other animals which also remain there. The Arctic Fox is rather smaller than the common fox; it is more densely clothed with a woolly fur, which on some parts is two inches in length; the tail is extremely bushy; and even the soles of the feet are thickly covered with hair. The colour is pure white in winter, at least in very cold climates; varying to a brownish or bluish colour in summer. It is gregarious, and many burrows are often found together. It is extremely cleanly in its habits, and is quite devoid of the offensive smell which belongs to most of the foxes; it is also much less cunning, and much more easily trapped, as well as much more gentle and capable of being tamed. Its flesh has been sometimes eaten by arctic voyagers, with a relish due to the extreme cold of the climate, and the consequent demand of the system for animal food. Its fur is not nearly equal in value to that of the red fox.

FOXE, JOHN, the martyrologist, was born of respectable parents in 1517, at Boston, Lincolnshire. In 1533, he entered as a student at Brasenose College, Oxford; in 1538, he took his Bachelor's, and in 1543, his Master's degree, and was elected a fellow of Magdalen College. He displayed at an early period an inclination for Latin poetry, and wrote several plays in that language upon scriptural subjects. Of these, the only one that remains, entitled *De Christo Triumphante*, was printed at London in 1551, and at Basel in 1556, 8vo, and 1672. The religious movements of the times led him to study the great controversy between Popery and Protestantism, and becoming a convert to the principles of the Reformation, he was, July 22, 1545, expelled from his college for heresy. His father being dead, and his mother married again, his step-father refused him any further aid, and he was, in consequence, reduced to great distress. For a short time, he was employed as tutor to the children of Sir Thomas Lucy of Charlecote, Warwickshire, and afterwards was engaged by the Duchess of Richmond as tutor to the children of her brother, the Earl of Surrey, then a state prisoner in the Tower. In this capacity he remained during the whole reign of Edward VI., but was never, notwithstanding Anthony à Wood's assertion to the contrary, restored to his fellowship at Magdalen. On June 23, 1550, he was ordained deacon by Ridley, Bishop of London, and preached the doctrines of the Reformation at Reigate. During the reign of Mary, he retired to the continent. On the accession of Queen Elizabeth, he returned to England in October 1559; and in May 1563, he was inducted into the canonry and prebend of Shipton, in the cathedral of Salisbury. He also enjoyed the living of Cripplegate, which he soon resigned, and for a year he held a stall at Durham. In 1575, when some Dutch Anabaptists were condemned to the flames in London, F. interceded for them with Queen Elizabeth and other persons in authority, but without effect. He wrote numerous controversial and other works, but the one that has immortalised his name is his *History of the Acts and Monuments of the Church*, popularly known as *Foxe's Book of Martyrs*, the first part of which was published at Strasburg in 1554. The first English edition appeared in 1563, in one vol. folio. Sanctioned by the bishops, it was ordered, by a canon of the Anglican Convocation, to be placed in the hall of every episcopal palace in England, and has gone through innumerable editions. It is not a very critical work, as might naturally be supposed, and Roman Catholics deny its trustworthiness. F. died in 1587, in his 70th year, and was buried in the chancel of St Giles's, Cripplegate, London.

FOXES AND FOX-HUNTING. The law with reference to fox-hunting, which is a matter of a good deal of importance in many parts of the country, seems to stand thus in England: 'Though in general all persons who go upon another's lands without permission are trespassers in the eye of the law, yet there are some cases where the trespass is said to be justifiable,' says Mr Paterson, the most recent writer on the subject, and he quotes Blackstone's dictum to the effect that 'the common law warrants the hunting of ravenous beasts of prey, as badgers and foxes, in another man's land, because the destroying such creatures is said to be profitable to the public' (3 Black. *Com.* 212). Care must be taken, however, that no damage be done beyond what is necessary for the public good, for that is the ground on which alone the legal character of fox-hunting can be maintained. It was found, moreover, in the Earl of Essex *v.* Capel (1 Chitt. Game L. 114), that though pursuing a fox on another's land be justifiable, yet, if it take to earth, or to a house there, it is not justifiable to dig or break doors for it. In Scotland, where, from the character of the country, fox-hunting is often impossible, it never has become a national sport to the same extent as in England; and consequently, the rule that one is entitled to enter on the lands of another for the purpose of killing a fox, has been confined to those cases in which he is pursued simply as a noxious beast, and fox-hunting for sport without leave has been held to be punishable as a trespass, and the trespasser held liable for whatever surface-damage he may occasion. In Ireland (by 1 and 2 Will. IV. c. 32, s. 35), persons pursuing with hounds any fox, hare, or deer which has been started elsewhere on another's land, are exempted from summary proceedings for trespass.

FOXGLOVE. See DIGITALIS.

FOXHOUND, a kind of dog much used in Britain for the sport of fox-hunting. It is not quite so large as the staghound, and is perhaps a mixed breed between the staghound or the bloodhound and the greyhound. The colour is commonly white, with large patches of black and tan colour. Their speed and perseverance are remarkable; they have been known 'to run hard for ten hours before they came up with and killed the fox, and the sportsmen were either thrown out, or changed horses three times.'

FOX-HUNTING, from its exciting nature, as well as from the qualities of daring courage and cool calculation requisite in those who thoroughly follow and appreciate it, has long been termed the king of British national sports.

In Great Britain, there are upwards of 100 hunting establishments, of which by far the greater proportion belong to the counties south of the Tweed. Fox-hunting establishments—which are in most instances supported by subscription, though sometimes owned by private gentlemen of wealth and influence—are organised and maintained at a very considerable annual cost, the price of a single pack of foxhounds sometimes amounting to several thousand guineas. Every establishment is under the direct superintendence and control of one experienced gentleman, the *master*, and under him again rank the huntsman, whippers-in, earth-stopper, kennel-servants, &c. A 'pack' is composed of from 20 to 60 couples of hounds, the number greatly depending upon the frequency of hunting-days: thus, some packs hunt six days, some five days, others four, and many only two days a week; 30 couple of hounds is a good average; these are carefully reared, fed, and otherwise attended to. The master himself, as a matter of course, has the general superintendence of the servants, hounds, and horses; and in the hunting-field is general director of the proceedings. Next to him come the huntsman and one or two 'whippers-in' ('whips'). The huntsman, who is practically the most important personage in the field, requires to see that his hounds are properly managed and fed in their kennels; duly led to the place of meeting on hunting-days; and, what is of more consequence still, that they receive fair-play in the field, and find and hunt their foxes in true style. The huntsman requires to be a man of great nerve and much activity: he should also have a good head, a clear ringing voice, a keen eye, and above all he must be a first-rate horseman, and know thoroughly every point in the country over which he hunts. He has often to restrain heedless riders, and 'keep the field back;' a duty requiring firmness of character, with a quiet and civil manner. With these necessary qualifications, and having so many responsible duties on his shoulders, he is treated with great respect by those for whom he provides sport: he is mounted on the best horses his master can produce, and may be said to conduct and direct the hunt from the moment the fox is found till the moment of its death—from 'find to finish.'

The duties of the first whipper-in, though not so responsible as those of the huntsman, are still considerable: for instance, he takes a certain management of the hounds in kennel, assists in conducting the hounds to the 'meet,' and aids the huntsman in various ways during the run. His knowledge of the management of hounds, and of fox-hunting generally, must at the same time be such as to enable him to occupy the huntsman's place in an emergency. The 'second whip's' principal duty is that of bringing up and urging on lagging hounds in the field, by lashing and 'rating.' In many hunts, however, a second whipper-in is dispensed with.

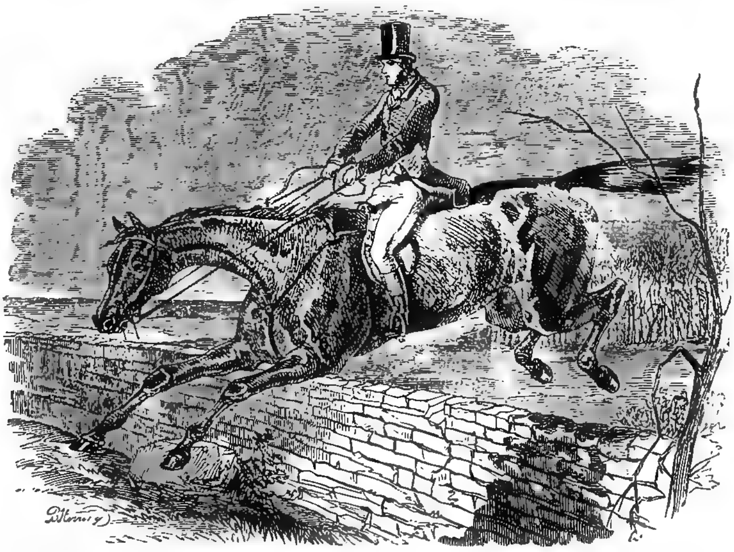
A considerable range of country is necessary for the full enjoyment of fox-hunting, the best being that which is diversified by pasturage and plantation. Being a nocturnal feeder, the fox quits his burrow or 'earth'—which is generally in a gorse brake, or a plantation or covert of underwood—during the night, and returns to it in the morning, and this fact is taken advantage of by those who hunt him for sport. The day and place of 'the meet' are duly advertised, and on the night before the hunt, the coverts to be 'drawn' next day are visited either by a duly appointed *earth-stopper* or by the gamekeeper, who, knowing that the foxes are from home, proceeds, spade in hand, from one hole to another, filling them up with earth and brushwood as he goes. Thus, the fox, upon returning at dawn to his 'earth,' finds ingress denied, and so betakes himself to some neighbouring thicket, or to some unenclosed cover of gorse, rushes, &c., where he makes a temporary lair or 'kennel.' When the earths have been carefully closed, the earth-stopper returns home and informs the huntsman, or first 'whip,' as to their number and locality, and that information forms a guide for the proceedings of the following day. (After the hunt is over, the earths are reopened, and as little trace as possible left of the work.) The hour of 'the meet' is usually ten or eleven o'clock A. M., and at the appointed place assemble the whole field, including master, huntsman, whippers-in, hounds, and those gentlemen (and frequently ladies) who intend either to participate in the day's sport, or merely to see the 'hounds throw off.' When a covert is reached, the huntsman, by a wave of his hand, or a few familiar words, such as 'Eu in! eu in there! good dogs!' 'throws in' his hounds, following immediately after with the first 'whip.' The mounted gentlemen usually remain outside, and take their directions as to stance, &c., from the master, who from this time forward does his best to control and direct their movements. In fact, the master may be said to have the control of the 'field'—that is, the riders—and the huntsman that of the hounds and hunt. The second whip being posted at the covert side, near where it is expected a fox may burst through or 'break,' one or two of the more eager riders are sometimes permitted to jump their horses into the covert, if it be large, to assist in the finding of the fox. Those who remain outside then prepare themselves for their work, and eagerly listen for the first token of the presence of reynard; this is betrayed by a slight but anxious whimper or whine from the 'challenging' hound—that is, the hound (usually an old and experienced one) that first perceives or 'hits' the scent of a fox—and is soon followed by others, who instantly rush to his side. The huntsman, if he be tolerably certain that the game scented is no other than a fox, at judicious intervals urges on his hounds by familiar expressions, such as 'Yoicks, yoicks, have at him!' 'Push him up!' &c., till the fox is fairly roused from his kennel, and goes away. It not unfrequently happens while drawing coverts, that hounds will come suddenly upon a fox, and seize him before he has time to escape. This is termed 'chopping,' and is always to be prevented if possible. If the covert be very thick, a fox may leave his kennel unperceived; and when he does so, he usually runs through or round the covert for a considerable distance before quitting it for the open fields. He may also 'run his foil,' by doubling back and forward on the same path or track, and thus possibly baffle the hounds, even when they 'own his scent.' In large coverts, too, a fox frequently 'hangs;' that is, he remains in it for a long time before going away. The person who first sees the fox 'break cover,' or, in other words, 'views him away,' should always allow him a certain 'law' before giving the 'view halloo,' as a fox will frequently turn or 'head back' into covert if he hears any unusual noise at the instant of his quitting it. When, however, the person or persons who are watching see that the fox is really off, notice is instantly given to those within the thicket, and those without, by the cry of 'Hou—y! hou—y! Tallyho! *Gone away!* GONE AW—AY!!' upon which the huntsman blows his horn to collect his hounds; the whipper-in drives out lagging members of the pack, either with his whip or by some cry; the master restrains the more impatient of the riders till the huntsman and hounds have 'settled to' their fox; and then he and the entire field join in the chase, and the first, and frequently the most exciting, part of the day's proceedings has commenced—the fox has 'broke cover,' the hounds have been 'laid on,' and the field has entered on its impetuous 'first burst.' A certain etiquette is, however, absolutely necessary in allowing the hounds and huntsman to get away *first;* but after that, each rider, with a certain deference to the master, chooses his own place in the hunt, and does his best, independently of his neighbours, to keep at a certain distance, not directly in the line, but to one side and in the rear of the hounds. When a rider happens to be near the pack at the first burst, and gets a good position in following them, he is said to 'get well away with the hounds;' and if well mounted and a skilful rider, his chances of both viewing the hunt and being 'in at the death' are very considerable. And now, as we have already said, begins the grand excitement of the day; the fox being fresh, races away at tremendous speed, followed by perhaps upwards of twenty couple of hounds at full cry. If the day is propitious (a 'southerly wind and cloudy sky' having long retained favour), the scent of the retreating fox lies well, especially at first, when it is called 'burning' or 'breast high,' and is for many minutes 'owned' by at least all the leading hounds in the pack, though, perhaps, the object of pursuit itself is far ahead, and out of sight; and away streams the hunt over hedges, ditches, and gates, across rivers, railways, arable land, and grass pastures, perhaps for several miles before a single *check* occurs. Now, the foxhound hunts almost entirely by scent, and does not, like the greyhound, depend upon the eye. The fact of scent failing, therefore, at any time during the hunt, throws out the hounds, and prevents them from renewing it, until the scent is recovered, or 'hit off.' When the scent is 'burning,' hounds run almost mute, though at first, and at intervals afterwards, they usually 'throw their tongues' pretty freely. When all the hounds are giving tongue, they are said to be at 'full cry,' and 'carry a good head,' the scent being on such occasions so thoroughly diffused as to be felt or 'owned' breast high by probably every member of the pack. Sometimes scent becomes so faint as to be hardly perceptible, and when this is the case, the energy of the hounds abates considerably; they then run with their heads close to the ground, and are said to hunt a 'cold' scent. Here, however, a little timely assistance from the huntsman is of the greatest moment in restoring animation to the pack. He waves his cap, blows his horn, and encourages his hounds by well-known expressions, to renewed exertions. When, as frequently happens from various causes, the scent fails entirely—such as the fox

Fox-hunting—'Gone away!'

crossing water, running through a drove of sheep, 'heading back' in another direction, running along or lying upon the tops of walls or thick hedges, &c.—the hounds cease 'giving tongue,' suddenly stop, throw up their heads, and are 'at fault.' In this emergency, the 'field' remains at a respectful distance behind, and the huntsman knowing, or at least guessing by experience which way the fox has taken, or the special means he has adopted for foiling the scent, allows his hounds at first, for a few moments, themselves to attempt to regain it; but failing that, and finding that his interference and assistance are necessary, he instantly blows his horn, and calls or 'lifts his hounds' from the place, and 'takes a cast' round and round about the spot where the scent failed, cheering them on the while. Thus, by gradually widening his casts, the scent is very frequently recovered or 'hit off,' a circumstance which is soon made apparent by the whimper of recognition given by the hound that first 'owns it,' followed by the answering tongues of the whole pack. When the hounds, however, fail to 'hit off' the scent, if the day be far advanced, they are taken home, or they are trotted on to some neighbouring covert, which is drawn for a fresh fox.

When the fox is killed, either in 'the open' or elsewhere, the rider who is first in at 'the death'—usually the huntsman—springs off his horse, with a 'Whoo! whoop!' lashes the hounds off, and cuts off the head, feet (*pads*), and tail (the *brush*). He then flings the carcass to the hounds, who tear it to pieces, and devour it in a very few minutes. The brush is usually presented to any lady who may happen to be in at the death, or is claimed as a trophy by one or other of the gentlemen present. The *pads* likewise are distributed amongst those who may wish to preserve mementos of the chase. As a general rule, the huntsman, and several of the best mounted in the field, manage to be in, either at or immediately after the death, though instances are not wanting when, during unusually protracted runs, the hounds have left every rider far behind, and have followed and killed their fox miles away from the spot where the last horseman had given in. A strong fox will 'live' before hounds on an average for an hour or an hour and a half; but cases have been known when this has been far exceeded, and when the run has extended to thirty or even forty miles, and has lasted all day, and even into the night. Young foxhounds begin their career by what is termed *cub-hunting;* but this, however necessary it may be for teaching them, is considered inferior sport to regular hunting.

The midland counties of England, such as Leicester, Northampton, Warwick, Yorkshire, &c., are the best for hunting purposes in Great Britain; and owe their superiority in a great measure to two causes: 1*st*, the strict preservation and consequent number of foxes; and 2*d*, the extensive tracts of pasturage being favourable both for running and scent. The instinct of the fox leads him, as a general rule, to run *down* wind, that his scent may not be blown *to* the hounds; he also takes advantage of every peculiarity in a country likely to offer him an advantage over his foes.



Blood Hunter clearing a stone wall in good style (from Blaine's *Encyclopædia of Rural Sports*).

The fox-hunter must be possessed of considerable courage, united with coolness, and must be a judge of pace and have a good eye in 'riding to hounds,' to avoid tiring or 'overmarking' his horse unnecessarily. Much of the excitement and pleasure of the fox-hunter consists in his successfully leaping the various hedges, ditches, fences, &c., encountered; but at the same time, a really skilful and humane rider, however well mounted, will never knowingly urge his horse at a fence or leap of any kind, unless he is positively certain it is within his horse's power; and if he finds his horse betrays symptoms of distress, he will rather turn its head homewards, and forego the chase, than overtax its courage and strength.

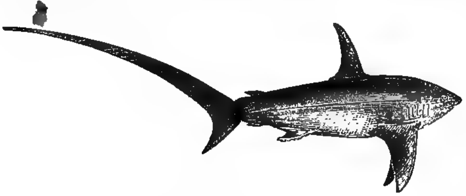
Much useful and entertaining information on fox-hunting occurs in Blaine's *Encyclopædia of Rural Sports* (London, Longmans); *British Rural Sports*, by Stonehenge; Beckford's *Thoughts on Hunting; Reminiscences of a Huntsman; Nimrod; The Field* newspaper; &c.

Fox-hunting is not practised after the English fashion in the northern states of America, but in the southern states from Maryland to Florida, it is a favourite amusement. The object of pursuit, however, is the *Gray Fox* (*Vulpes Virginianus*), and the chase is not so severe, and seldom lasts so long as that of the common fox.

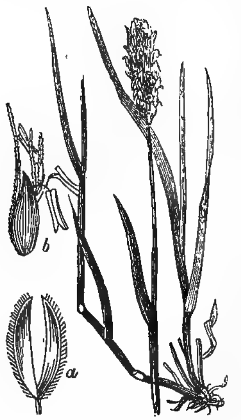
FOX ISLANDS, another name for the Aleutian Islands (q. v.).

FOX RIVER is the name of two considerable streams in the United States of America, both of them rising in Wisconsin.—1. The F. R., or *Pishtaka*, is an affluent of the Illinois, which is itself a tributary of the Mississippi. It is 200 miles long, and is valuable chiefly for its water-power.—2. The F. R., or *Neenah*, after a course of about the same length, falls into Green Bay in Lake Michigan. It is divided into two sections by Lake Winnebago, the upper one being connected by a canal with the Wisconsin, so as to link together the Mississippi and the Great Lakes of the St Lawrence.

FOX SHARK, or **THRESHER** (*Alopias* or *Alopecias*), a genus of sharks, containing only one known species (*A. vulpes*), an inhabitant of the Mediterranean and of the Atlantic, and occasionally seen on the British coasts. The snout is short and conical; the spout-holes are very small; the mouth is not so large as that of the white shark, nor the teeth so formidable; but the F. S. is extremely bold and voracious, readily attacking grampuses or dolphins much larger than itself. Its most remarkable peculiarity is the great elongation of the upper lobe of the tail-fin, which is nearly equal in length to the whole body, and into which the vertebral column extends. Of this it makes use as a weapon, striking with great force. It is said to be not uncommon for a whole herd of dolphins to take flight at the first splash of the tail of a fox shark. From the use which it makes of its tail, it has acquired the name of Thresher. It attains a length, tail included, of 13 feet. The body is spindle-shaped.



Fox Shark (*Alopias vulpes*).



Foxtail Grass (*Alopecurus pratensis*):
a, glumes; *b*, floret.

FOXTAIL GRASS (*Alopecurus*), a genus of Grasses, distinguished by a spiked panicle, two *glumes* nearly equal, and generally united at the base, enclosing a single floret which has a single *palea*, with an awn rising from the base. The species are chiefly natives of temperate countries, and about six are British. Meadow Foxtail Grass (*A. pratensis*), which has an erect smooth culm about 1½–2 feet high, and a cylindrical obtuse panicle abundantly covered with silvery hairs, is one of the best meadow and pasture grasses of Britain, but does not arrive at full perfection till the third year after it is sown. It bears mowing well, and is reckoned a good grass for lawns. It bears drought well. The Jointed Foxtail Grass (*A. geniculatus*), with an ascending culm bent at the joints, is very common in moist places, and cattle are fond of it, but it is a small grass. The Slender Foxtail Grass (*A. agrestis*) is an annual or biennial, of little value except for light sandy soils, on which it is sometimes sown. A foreign species (*A. nigricans*), a native of the continent of Europe and of Siberia, has been introduced into Britain, and appears likely to prove valuable. It has somewhat creeping roots, is a little larger and stronger than *A. pratensis*, and is rather earlier.

FOY, Maximilien Sébastien, a distinguished French general and orator, was born at Ham, 3d February 1775. In 1791, he was one of the volunteers who hastened to defend the frontiers of their country against foreign invasion, and during the next nine years, served with distinction under Dumouriez, Moreau, and Massena. In 1800, he was raised to the rank of adjutant-general in the division of Moncey, in the army of the Rhine, which marched through Switzerland into Italy, where he commanded the vanguard of the army in 1801. In 1805, he commanded the artillery of the second division in the Austrian campaign. In 1807, Napoleon sent him to Turkey at the head of 1200 artillerymen, to assist Sultan Selim against the Russians and British. After the revolution in which Selim was dethroned, F., under the direction of the French ambassador, General Sebastiani, defended Constantinople and the Strait of the Dardanelles so effectively, that Duckworth, the British admiral, was obliged to retire with loss. From 1808 to 1812, F. was general of division of the army in Portugal. His talents were exhibited to advantage in conducting the retreat of the French army across the Douro. F. was present at all the battles of the Pyrenees, and at Orthez, in 1814, was dangerously wounded. In the campaign of 1815, he commanded a division on the field of Waterloo, where he was wounded for the fifteenth time. In 1819, he was elected deputy by the department of Aisne. In the chamber, he was the constant advocate of constitutional liberty, and shewed great rhetorical talent and knowledge of political economy. He distinguished himself particularly by his eloquence in opposing the war against Spain in 1823. F. died at Paris, November 28, 1825. Madame Foy published, in 1827, from her husband's papers, a *Histoire de la Guerre de la Péninsule*. In the previous year appeared his *Discours*, with a biography.

FOY'ERS, a stream rising in the Monadleadh Mountains, in the middle of Inverness-shire. It runs 12 miles north, and falls into the east side of Loch Ness, nearly opposite Mealfourvounie Mountain. It has two celebrated falls within a mile and a half of its mouth, where the stream rushes through a deep, narrow ravine in the hills, skirting the east side of the loch. The upper fall is 30 feet high. The stream then descends 30 feet in a quarter of a mile. The lower fall (specially called *The Fall of Foyers*) is 90 feet high. It is the finest cascade in Britain.

FOYLE, Lough, an inlet of the Atlantic, on the north coast of Ireland, between the counties of Derry and Donegal. It is triangular in form, 16 miles long from north-east to south-west, 1 mile wide at its entrance, and 9 miles broad along its south side. A great part is dry at low water, and its west side alone is navigable. Vessels of 600 tons ascend the west side of the lough, and its chief tributary the Foyle (which comes 16 miles from the south), to Londonderry. On the east shore is a flat strand with a sandy beach, on which, in 1827, was measured a line of 41,640, which was afterwards extended by triangulation to about 53,200 feet, and formed the base line of the Ordnance Survey of Ireland.

FRA BARTOLOMEO. See Baccio della Porta.

FRACASTORO, Girolamo, an Italian savant and philosopher, famous for the universality of his learning, was born of an ancient family at Verona in 1483. At the age of 19, he was appointed professor of logic in the university of Padua. But his vast knowledge embraced the most divergent sciences, and on account of his eminence in the practice of medicine, he was elected physician of the Council of Trent. His Latin verse also exhibits remarkable elegance. He died in 1553. A bronze statue was erected in his honour by the citizens of Padua, while his native city commemorated their great compatriot by a marble statue. His writings in prose and verse are numerous. The chief are—*Syphilidis, sive Morbi Gallici* (Verona, 1530, in 4to; Paris, 1531 and 1539, in 8vo; London, 1720, in 4to, and 1746, in 8vo; Italian edition, Verona, 1739, in 4to, by Tiraboschi; Naples, 1731, by Pietro Belli); *De Vini Temperatura* (Venice, 1534, in 4to); *Homocentricorum sive de Stellis, De Causis Criticorum Dierum Libellus* (Venice, 1535, in 4to); *De Sympathia et Antipathia Rerum, De Contagionibus et Contagiosis Morbis, et eorum Curatione* (Venice, 1546, in 4to; Lyon, 1550, 1554, in 8vo). The collective works of F. appeared for the first time, Venice, 1555, in 4to.

FRA'CTED, heraldically, signifies broken asunder.

FRACTION. In Arithmetic, a fraction is any part or parts of a unit or whole, and it consists of two members, a denominator and a numerator, whereof the former shews into how many parts the unit is divided, and the latter shews how many of them are taken in a given case. Thus $\frac{3}{4}$ denotes that the unit is divided into four parts, and that three of them are taken; and more generally $\frac{a}{b}$ denotes that the unit is divided into b parts, and that a of them are taken. A fraction is called *proper* when the numerator is less than the denominator, and *improper* when the numerator is greater than the denominator. In Algebra, any quantity $\frac{a}{b}$ is called a fraction, although a and b are not necessarily representatives of whole numbers, as they would require to be if the fraction be an arithmetical fraction. The algebraical fraction $\frac{a}{b}$ just means that any quantity affected by it is to be *multiplied* by a, and *divided* by b. This definition, however, through the greater generality of algebra, includes that of an arithmetical fraction. The rules for the addition and multiplication of fractions are the same in algebra and arithmetic. To add two or more fractions together, we must bring them to a common denominator, and add the numerators for a new numerator, and take the common denominator for the new denominator. Thus if $\frac{a}{b}$, $\frac{c}{d}$ be two fractions, then $\frac{a}{b} + \frac{c}{d} = \frac{ad}{bd} + \frac{cb}{bd} = \frac{ad + bc}{bd}$, the fractions being brought to a common denominator by (as a general rule) multiplying each numerator by every denominator, except its own, and multiplying all the denominators for the common denominator. To subtract two fractions, we bring them to a common denominator, and subtract their numerators for the new numerator. Thus $\frac{a}{b} - \frac{c}{d} = \frac{ad - bc}{bd}$. To multiply two fractions together, the rule is, to multiply the numerators together for a new numerator, and the denominators together for the new denominator. Thus $\frac{a}{b} \times \frac{c}{d} = \frac{ac}{bd}$. The reasons for all these rules are obvious. The rule of division is to invert the divisor, and proceed as in multiplication. This follows from the consideration, that to *divide* is the inverse of to multiply, and that to divide by $\frac{a}{b}$ must be the same thing as to multiply by $\frac{b}{a}$.

FRACTIONS, Continued. If $\frac{A}{B} = a + \frac{a_1}{B}$, and $\frac{B}{a_1} = b + \frac{b_1}{a_1}$, and $\frac{a_1}{b_1} = c + \frac{c_1}{b_1}$, and.... $\frac{k_1}{l_1} = m + \frac{m_1}{l^1}$, and $\frac{l^1}{m_1} = n + \frac{n^1}{m_1}$, &c.

Then
$$\frac{A}{B} = a + \cfrac{1}{b + \cfrac{1}{c + \cfrac{1}{d + \dotsb \cfrac{1}{m + \cfrac{1}{n + \dotsb}}}}}$$

This expression for the value of $\frac{A}{B}$ is called a continued fraction. If we consider the fractions (1) $\frac{a}{1}$, (2) $a + \frac{1}{b}$ or $\frac{ab + 1}{b}$, (3), $a + \cfrac{1}{b + \cfrac{1}{c}}$ or $\frac{(ab + 1)c + a}{bc + 1}$, formed by taking into account parts only of the denominator in the continued fraction, we obtain a series of fractions *converging* to the value of $\frac{A}{B}$. These converging fractions are always approximating to the value of $\frac{A}{B}$, and are alternately greater and less than it. Throughout the series, the 1st, 3d, 5th, 7th, &c., are each below the true value, while the 2d, 4th, &c., are above it; or *vice versa*, according as the original fraction is improper or proper. It can be shewn that the successive converging fractions approach nearer and nearer to the true value of the continued fraction. Converging fractions are of great use in the summation of infinite series.

In illustration of the above general statement, let us take the numerical fraction $\frac{6935}{2151}$, which we first reduce to a continued fraction in the following manner: $\frac{6935}{2151} = 3 + \frac{482}{2151} = 3 + \frac{1}{\frac{2151}{482}} = 3 + \frac{1}{4 + \frac{223}{482}} =$ (by continuing the same process)

$$3 + \cfrac{1}{4 + \cfrac{1}{2 + \cfrac{1}{6 + \cfrac{1}{5 + \cfrac{1}{7}}}}}$$

or, as it is now commonly written, $\frac{3}{1} + \frac{1}{4} + \frac{1}{2} + \frac{1}{6} + \frac{1}{5} + \frac{1}{7}$

Here the first convergent is 3; the second, $\frac{3}{1} + \frac{1}{4} = \frac{13}{4}$; the third is $\frac{3}{1} + \frac{1}{4} + \frac{1}{2} = 3 + \frac{2}{9} = \frac{29}{9}$; and finding the other convergents in a similar manner, we have the following approximations to the value of the original fraction :

$$3,\ \frac{13}{4},\ \frac{29}{9},\ \frac{187}{58},\ \frac{964}{299},\ \frac{6935}{2151}.$$

The differences between the successive convergents and the original fraction are,

$$\frac{6935}{2151} - 3 = \frac{482}{2151} \left(\text{being less than } \frac{1}{1 \times 4}\right),$$

$$\frac{13}{4} - \frac{6935}{2151} = \frac{223}{8604} \left(\text{being less than } \frac{1}{4 \times 9}\right), \text{ \&c.;}$$

and in general the difference between any convergent and the original fraction is less than a fraction = $\frac{1}{\text{denom. of convergent} \times \text{denom. of conv. next greater}}$; consequently, the differences grow less as we proceed, owing to the denominators of the convergents always increasing. If, by actual subtraction, we find successively the difference between each convergent and the original fraction, we shall also find that they are alternately greater and less, or less and greater, according as the original fraction is proper or improper.

FRACTIONS, Vanishing. In some algebraical fractions, the substitution of a particular value for the unknown quantity will make both the numerator and denominator of the fraction vanish; such fractions are called vanishing fractions. Thus the fraction $\frac{x^2 - 1}{x - 1}$ assumes the form $\frac{0}{0}$ when $x = 1$. The ascertainment of the value of such a fraction for the particular value of the unknown quantity which gives it the form $\frac{0}{0}$, may in all cases be effected by a general method furnished by the differential calculus. But frequently that value may be determined by simpler means, as the form $\frac{0}{0}$ arises from the existence of a factor common to both numerator and denominator, which becomes zero for a particular value of x; if, then, we can discover this factor, either by finding the greatest common measure or otherwise, and divide it out, then by substitution we obtain the value of the fraction corresponding to the particular value of x. Thus, in the example given, we find that both terms are divisible by $x - 1$, so that $\frac{x^2 - 1}{x - 1} = x + 1$. Therefore, when $x = 1$, and the fraction becomes $\frac{0}{0}$, its value must equal 2. This is an example of the application of the method of Limits to the determination of the value of such a fraction, for it is clear that for every value of $x > 1$, the value of the fraction is > 2, and continually approaches 2 as x approaches 1. Much discussion has taken place as to whether vanishing fractions have, properly speaking, values or not; but this is not the place for noticing speculations on the subject. See Limits, Theory of; and Nothing, and Infinity.

FRACTURE of a bone may be the result of accident, muscular action, or disease. The long bones of the limbs are more subject to the latter two causes than those of the head or spine. *Predisposing causes* to fracture are frosty weather, old age, cancerous disease, a morbidly brittle condition called *fragilitas ossium.*

Some bones, as the kneepan and heel-bone, are liable to give way from sudden contraction of the muscles which are inserted into them. The subject of the injury then falls, and attributes the accident to the fall, whereas it is the reverse. A medical man, some few years ago, awoke with a fit of cramp, and almost immediately his left thigh-bone broke with a snap. It reunited in the usual time. The sufferer from cancer of long standing, sometimes feels a bone give way under no special strain. In such cases, there is seldom any attempt at repair. The bones of old people are brittle from the excess of earthy materials (see Bone), and so readily give way. The bones of the feeble patient, with fragilitas or mollities ossium, are soft and friable, and when examined, are found saturated with a greasy substance.

There are some persons who seem liable to fracture without any such reason. Professor Gibson of America mentions a boy who, though apparently healthy, had broken his collar-bones eight times, his arm and forearm, while his leg and thigh were broken if he but tripped his foot on the carpet. An old lady once broke both thigh-bones kneeling down in church. There is one predisposing cause to fracture fortunately now but seldom seen—viz., scurvy. Not only did it make the bones brittle, but, as was seen in Lord Anson's expedition, which was manned chiefly by pensioners, old fractures again became disunited.

Repair of a broken Bone.—Of course, as the bone lies in the midst of soft parts, any injury to the one must tear the other, and cause an infusion of blood; but the latter is speedily absorbed, and is of no service in the process of repair. After the first excitement has passed off, a fluid is effused around the fragment, which in a short time becomes converted into bone. The amount of this new material depends upon the position of the fragments; should they be far apart, or, as it is technically termed, riding, then a much larger quantity of new bone is thrown out. We see this in animals to such an extent that the materials for repair, or 'callus,' may be divided into two separate parts—a provisional callus to act as a wrapper to the bones until the permanent callus, or that which unites the ends, however far apart, becomes sufficiently hard; then the provisional callus, being no longer necessary, is removed by absorption.

Symptoms of Fracture.—A broken limb hangs loose, and is, as a general rule, no longer under the control of the muscles, which, however, are pricked by the broken ends of bone, and stimulated into painful spasms, which still further displace and deform the limb. Should there be any doubt, the limb may be carefully raised, and turned gently from side to side, when a peculiar rough feeling termed *crepitus* removes all doubt. Each bone, however, when broken, exhibits symptoms peculiar to itself, and requires a separate treatment.

Fractures are divided into *Simple*, when there is no wound in the skin which communicates with the fracture; *Compound*, when there is such a wound; *Comminuted* being prefixed to either of these terms when the bone is broken into several pieces; *Impacted*, when one fragment is driven into the other; and *Complicated*, when a neighbouring joint or large blood-vessels participate in the accident.

Treatment of Fracture.—Replace the fragments as near as possible to their former positions by gentle extension, retain them in place by substituting an *external* rigid skeleton, made of any unyielding material which will be firm enough to resist the spasms already alluded to, but is not fastened with very great tightness to the limb. *Splints* are generally of wood or pasteboard; but of late years gutta percha has been much used. In simple fractures, it is often sufficient to adapt a bandage to the limb, which will harden on drying, and form a *shell* for it; for this purpose, starch, dextrine, and plaster of

Paris are generally used. Whatever the splint be made of, it must keep the bones in a state of *complete rest*, otherwise the lymph, which would be formed into bone, stops, as it were, half way, and becomes fibrous tissue, which allows the fragments to move on each other, and is termed a false joint.

FRA DIA'VOLO, properly MICHELE PEZZA, a celebrated brigand and renegade monk, born in Calabria in 1760. Of plebeian origin, he at first followed the trade of stocking-weaver, then entered the Neapolitan army; and subsequently the service of the pope; finally, he abandoned military life, and became a monk, but being expelled for misconduct, he withdrew to the mountains of Calabria, where he headed a band of desperadoes, whose strongholds lay chiefly in the district between Itri and Terra di Lavoro. Pillage, bloodshed, and atrocious cruelties, signalised his career. For years he evaded the pursuit of justice by retiring to his haunts amidst mountains and forests, and skilfully defeating, with much inferior numbers, all the armed forces despatched against him. He became at length known among the peasantry of the neighbourhood as Fra Diavolo. On the advance of the French into the Neapolitan states, F. D. and his band espoused warmly the royal interests, and in return were not only pardoned and reinstated in civil rights, but promoted to the grade of officers in the royal army, F. D. himself becoming colonel. In 1806 he attempted to excite Calabria against the French, but was taken prisoner at San Severino, and was executed at Naples in November of the same year. The opera of Auber has nothing in common with F. D. but the name. He died uttering imprecations on the queen of Naples and the British admiral, Sidney Smith, whose influence had not sufficed to rescue him from death, although on his capture he produced papers bearing the royal seal, which vouched for his right to the rank of colonel in the royal forces.

FRAGA'RIA. See STRAWBERRY.

FRAME, in Gardening, the covering of any kind of hotbed, flued pit, or cold pit, used for the cultivation of plants not sufficiently hardy for the open air. Frames are of various materials, but generally of wood or iron and glass, and are made in one piece or in sashes according to the size of the hotbed or pit.

FRAME-BRIDGE, a bridge built of timbers framed together in such a manner as to obtain the greatest possible amount of strength with a given quantity of material.

The fundamental principle upon which all such construction is based, is that the timbers shall be so arranged that the weight put upon them shall exert a pulling or a crushing strain, instead of a transverse strain, and, if possible, that the greatest strain shall act as a direct pull in the direction of the fibres of the wood. The construction of a frame-bridge is very similar to that of a roof, excepting that in the bridge a considerable outward thrust upon the abutments is generally permissible, while the walls of a house will not stand this; and that for the bridge a nearly level way on the top is desirable, while for a roof a steep incline is not objectionable, or is even desirable. Fig. 1 represents a simple and useful form of frame-bridge. It will be seen at once that a weight upon the bridge will exert a pulling strain upon the horizontal timber *ab*, and a crushing strain upon *bc* and *ad*, as well as upon the upper timbers, and that the main support is in *ab*, which must be torn asunder before *ad* and *bc* can be bent or displaced to any considerable extent.

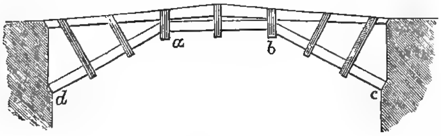


Fig. 1.

The celebrated frame-bridge of Schaffhausen, constructed in 1757 by Grubenmann, a village carpenter, was built exactly in the manner of a roof with a horizontal pathway superadded. It was composed of two arches, one 193 feet, the other 172 feet span. It was merely laid upon the piers, and did not abut against them to exert any outward thrust, as will be seen by fig. 2. The weight on the bridge is transmitted by the oblique beams, which by analogy we may call *rafters*, to the tie-beam *ab*, where it exerts a horizontal pulling strain. These rafters are framed into the tie-beam so as to abut firmly against it in the same manner as Roof-rafters (see ROOF). This kind of frame-bridge is very common in Switzerland, where timber-bridges abound; and it has doubtless originated from the fact, that most of the bridges have been built by the local carpenters, who are accustomed to the construction of roofs of considerable span for the commodious square-built wooden cottages with overhanging roofs, so common in that country. Frame-bridges of more complex structure are sometimes built; in some of these, the timbers are framed so as to present an arched form. In these cases, the structure is very similar to those described and figured under CENTERING. The serious defect of all such bridges is their liability to decay from exposure to moisture, &c., especially at the joints, where water is apt to lodge and remain, from want of free circulation of air to evaporate it. In the bridge of Schaffhausen above described, it was found that when it had stood but 26 years, the oak-beams, where they rested on the masonry at *a* and *b*, fig. 2, were rotted, and the frames began to settle. This was remedied by a carpenter named Spengler, who raised the whole structure upon piles by means of screw-jacks, and replaced the decayed wood. Means should be adopted to admit the free circulation of air in those parts where the timber rests upon the masonry, and to prevent water from settling in the timber joints. The covered bridges of Lucerne and other parts of Switzerland are well known as objects of special interest to tourists, who usually imagine that the roofs are made for the comfort of travellers, but their main object is the preservation of the bridge.

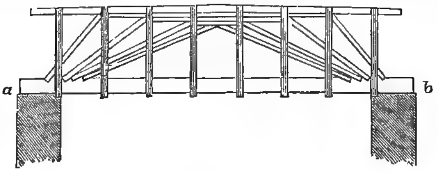


Fig. 2.

FRAMING, the jointing, putting together, or building up of any kind of artificers' work. The framing of timber generally is described under CARPENTRY, and special kinds of framing under CENTERING, DOOR, FLOORS, FRAME-BRIDGE, PARTITIONS, ROOFS, &c. In such trades as mathematical, optical, philosophical, and other complex instrument-making, the workman who does flat-filed work, and fits all the parts, and puts the whole instrument together, is called the *framer*, and his work *framing*.

In the watch-trade, the man who frames all the parts together and builds up the watch is called a finisher, and his work is called finishing, though it corresponds with what is called framing in other trades.

FRA'MLINGHAM, or 'Strangers' Town,' a town in the east of Suffolk, on the left bank of the Ore, 14 miles north-north-east of Ipswich. It consists of a large market-place, from which a few streets irregularly branch out. The church is built of black flint and stone, and contains the monuments of Thomas Howard, third Duke of Norfolk, and of his duchess, and of the unfortunate Henry Howard, Earl of Surrey, and of his countess. Here are the remains of a castle with thirteen square towers, where Queen Mary retired after the death of her brother Edward VI. Pop. (1861) 2252.

FRANC, a French silver coin and money of account, which (since 1795, when it supplanted the livre Tournois) forms the unit of the French monetary system, and has also been adopted as such by Belgium and Switzerland. The franc is coined of silver, nine-tenths fine, and weighs five grammes, its value being about 9½*d.* One pound sterling = 25·2 francs. The franc is divided into 100 centimes, but the old division into 20 sous is still made use of in common life. There are in France silver coins of ¼, ½, 1, 2, and 5 francs; and gold pieces of 20 and 40 francs. Sardinia has also adopted the French money-system, only that the franc is called *Lira nuova.*

FRANCAVI'LLA, a town of Naples, in the province of Otranto, is situated on an elevation 22 miles south-west of Brindisi. It is well built, has a college, three hospitals, and several convents; has manufactures of woollens, cottons, and earthen-ware, and, with its dependent villages, has a population of 15,300.

FRANCE, the most westerly portion of Central Europe, extends from 42° 20′ to 51° 5′ N. lat., and from 8° 15′ E. long. to 4° 54′ W. long. It is bounded on the N. by the Channel and the Straits of Dover, which separate it from England, by Belgium, the grand-duchy of Luxembourg, and the Rhenish provinces of Prussia and of Bavaria; on the E. by the grand-duchy of Baden, from which it is separated by the Rhine, by several of the Swiss cantons, and by Sardinia; on the S. by the Mediterranean and the dominions of Spain, from which it is separated by the Pyrenees; and on the W. by the Atlantic (the Bay of Biscay). The greatest length of F., measured from Dunkirk in the north to the Col de Falguères in the south, is about 620 miles; and its greatest breadth from east to west, measured from Kehl, on the Lower Rhine, to Cape St Matthieu, in Finisterre, is about 570 miles. Its circumference, inclusive of sinuosities, is estimated at nearly 3100 miles, or 5000 kilomètres, of which nearly the half is composed of maritime coast-lines, which are subdivided in the proportion of about 600 kilom. on the Mediterranean, 950 kilom. on the Atlantic, and about 940 kilom. on the northern frontiers. The superficial area of F., including the new Savoy provinces, but exclusive of the isle of Corsica, is reckoned at 201,578 sq. miles; and as the Corsican island has an area of about 3350 sq. miles, the total is 204,928 sq. miles. The possessions of F. which are situated in non-European parts of the world, have a total superficial area of 334,258 sq. miles, and the largest is Algeria, with an area of 149,916 sq. miles. F. is divided into eighty-nine départements (inclusive of Savoy and Nice), most of which have been named from the rivers or mountains by which they are intersected. The following table gives the names of the ancient provinces of F., with the corresponding départements, their areas in hectares, and the population for 1856.

Provinces.	Departements.	Area in Hectares.	Population in 1856.
1. Ile de France.	1. Seine,	47,500	1,727,419
	2. Seine-et-Oise,	560,337	484,179
	3. Seine-et-Marne,	588,575	341,382
	4. Oise,	583,067	396,085
	5. Aisne,	735,747	555,539
2. Champagne	6. Ardennes,	523,000	322,138
	7. Marne,	818,038	372,050
	8. Marne (Haute),	625,403	256,512
	9. Aube,	602,212	261,673
3. Lorraine.	10. Meuse,	621,618	305,727
	11. Moselle,	536,888	451,152
	12. Meurthe,	609,406	424,373
	13. Vosges,	607,996	405,708
4. Flanders.	14. Nord,	567,863	1,212,358
5. Artois.	15. Pas-de-Calais,	660,426	712,846
6. Picardy.	16. Somme,	615,983	566,619
7. Normandy.	17. Seine-Inférieure,	603,463	769,450
	18. Eure,	591,261	404,665
	19. Calvados,	551,766	478,397
	20. La Manche,	577,178	595,202
	21. Orne,	610,068	430,127
8. Brittany.	22. Finisterre,	667,668	606,552
	23. Morbihan,	681,704	473,932
	24. Côtes-du-Nord,	744,073	621,573
	25. Ille-et-Vilaine,	672,848	580,898
	26. Loire-Inférieure,	687,441	555,996
9. Poitou.	27. Vendée,	671,628	389,683
	28. Sèvres (Deux),	599,995	327,846
	29. Vienne,	697,301	322,585
10. Anjou.	30. Maine-et-Loire,	712,563	524,387
11. Maine.	31. Mayenne,	516,200	373,841
	32. Sarthe,	620,397	467,193
12. Angoumois, Aunis, and St Ange.	33. Charente,	588,803	378,721
	34. Charente-Inférieure,	716,814	474,828
13. Touraine.	35. Indre-et-Loire,	611,369	318,442
14. Orléannais.	36. Loir-et-Cher,	635,092	262,043
	37. Eure-et-Loir,	586,921	291,074
	38. Loiret,	676,512	345,115
15. Nivernais.	39. Nièvre,	686,619	326,086
16. Bourbonnais	40. Allier,	742,272	352,241
17. Marche.	41. Creuse,	579,455	278,889
18. Berry.	42. Cher,	740,125	314,982
	43. Indre,	701,661	273,479
19. Limousin.	44. Vienne (Haute),	551,733	319,787
	45. Corrèze,	586,621	314,982
20. Auvergne.	46. Cantal,	574,146	247,665
	47. Puy-de-Dôme,	800,679	590,062
21. Lyonnais.	48. Loire,	477,018	505,260
	49. Rhone,	281,356	625,991
22. Burgundy.	50. Ain,	584,822	370,919
	51. Saône-et-Loire,	855,018	575,018
	52. Côte-d'Or,	876,956	385,131
	53. Yonne,	736,916	368,901
23. Franche Comté.	54. Saône (Haute),	531,000	312,397
	55. Jura,	503,364	296,701
	56. Doubs,	522,895	286,888
24. Alsace.	57. Rhin (Haut),	410,720	499,442
	58. Rhin (Bas),	455,034	563,855
25. Dauphiné.	59. Isère,	841,230	576,637
	60. Drôme,	653,557	324,760
	61. Alpes (Hautes),	553,418	129,556
26. Languedoc	62. Ardèche,	551,227	385,835
	63. Loire (Haute),	495,784	300,994
	64. Lozère,	516,666	140,819
	65. Gard,	582,867	419,697
	66. Hérault,	630,935	400,424
	67. Tarn,	576,821	354,832
	68. Garonne (Haute),	629,601	481,247
	69. Aude,	631,667	282,833
27. Guienne.	70. Aveyron,	882,171	393,890
	71. Lot,	398,406	293,733
	72. Dordogne,	915,000	504,651
	73. Tarn-et-Garonne,	371,764	234,782
	74. Lot-et-Garonne,	534,628	340,041
	75. Gironde,	1,082,552	640,757
28. Gascony.	76. Les Landes,	985,273	309,832
	77. Gers,	627,870	304,497
	78. Pyrénées (Hautes),	464,531	245,856
29. Bearn and Navarre.	79. Pyrénées (Basses),	752,513	436,442
30. Foix.	80. Ariège,	478,401	251,318
31. Roussillon.	81. Pyrénées Orientales,	411,376	183,056
32. Avignon, Venaissin, and Orange.	82. Vaucluse,	356,640	268,994
33. Provence.	83. Rhône(Bouches-du),	601,960	473,365
	84. Alpes (Basses),	690,919	149,670
	85. Var,	729,628	305,398
34. Corsica.	86. Corse,	874,741	240,183
			In 1860.
35. Savoy.	87. Savoie,	642,074	318,000
	88. Savoie (Haute),	451,482	286,000
	89. Alpes Maritimes,	429,874	192,000

The province of Savoy and the arrondissement of Nice, incorporated with Grasse in the new département of the Alps Maritimes, were ceded to F. by Sardinia, in accordance with a treaty between the two governments, signed in 1861. The following table gives the Non-European dependencies of France:

	Area in Eng. Sq. Miles.	Total Population.
In Africa—		
Algeria, ...	149,916	3,006,498
Senegal and its Dependencies,	96,484	272,800
Iles de Réunion, Ste-Marie, Nossi-bé, and Mayotte, . .	1,380	206,041
In Asia—		
East Indian Settlements, . .	189	220,478
Cochin China, ...	7,719	1,500,000
In America—		
Martinique, ...	381	135,991
Guadeloupe and Dependencies,	419	138,069
Guyane, ...	69,469	25,687
St Pierre and Miquelon, . .	81	2,311
Carry forward, .	176,122	2,501,377
Brought forward, . .	176,122	2,501,377
In Oceania—Marquesas Archipelago,	501	12,000
New Caledonia and Isle of Pines, .	7,719	50,000
Loyalty Islands, . . .	?	15,000
Total of Colonies, exclusive of Algeria, now incorporated with Empire	184,342	2,578,377
Territories under French Protectorate.		
Asia—Kingdom of Cambodia, .	?	1,000,000
Africa—Porto Novo, . .	?	20,000
Oceania—Society Islands, . .	579	9,000
Pomatu, Wallis, Gambier, and Tubuai Isles, . . .	771	18,460
.	1,350	1,047,460

Population.—The population of F. has not exhibited the same rate of increase as other first-class European powers during the present century, for while the population of Great Britain has nearly doubled within the last fifty years, that of F. scarcely shews an increase of 40 per cent. for the same period.

The following table shews the condition of the population from the beginning of the century to the date of the latest census:

Year of Census.	Number of Population.	Annual Increase.
1801 . . .	27,349,003	149,941
1806	29,107,425	351,685
1821 . . .	30,461,875	90,292
1826	31,858,937	279,415
1831 . . .	32,569,223	171,787
1836	33,540,901	194,337
1841 . . .	34,217,719	135,362
1846	35,400,486	236,553
1851 . . .	35,783,170	76,537
1856	36,039,364	51,236
1861 . .	37,382,225	268,572

Coast, Islands, and Frontier.—The north-north-west coast is generally irregular, indented with numerous bays, the principal of which is the Bay of St Malo, in which lie the Channel Islands, Jersey, Guernsey, &c., which belong geographically to F., the archipelago of Bréhat, &c. The west-south-west coast is at first lofty and precipitous, but to the south of Bretagne it becomes more shelving, and is interspersed with isolated rocks and promontories; while south of the Loire it is low, and lined with salt marshes, but towards the foot of the Pyrenees it again assumes a rocky and precipitous character. This coast forms one side of the bay designated by the French as the Bay of Gascogne, but by the English as the Bay of Biscay. Here lie the islands of Ushant (Ouessant), Belleisle, Noirmoutier, Isle d'Yeu, Ré, Oléron, &c. The coast of the Mediterranean, which is broken by lagoons or shore-lakes, is low till it has passed Toulon, after which it becomes bolder. The only islands off the shore are the Hyères, near Toulon; the larger island of Corsica (q. v.) lies north of Sardinia. The Mediterranean here forms two bays or gulfs, as the Gulf of Lyons (Fr. *Golfe du Lion*, so named from the violence of its storms), and the Gulf of Genoa, which belongs only in part to France. The land frontiers of F. are formed on the side of Spain by the Pyrenees; on that of Sardinia and Switzerland, by the Alps and Jura chain; on that of Baden, by the Rhine; on the north-east, the frontier line is unprotected by natural boundaries, but is defended by various strong fortresses, as those of Strasbourg, Besançon, Metz, Sedan, Mezières, Givet, Valenciennes, Lille, &c.

Plains.—The chief plains are those of Lorraine, Alsace, and Burgundy; and the great north-west Oceanic plain, embracing the lower basins of the Seine, Loire, and Garonne. There are four great mountain chains belonging to France: the Pyrenees (q. v.), which separate the French territory from Spain; the Cevenno-Vosgian range, formed of the Cevennes (q. v.), running east and west between the Rhone and Loire, and the Vosges (q. v.) inclining north and south, and running between the Rhine and Moselle; the Alps (q. v.), which separate the Swiss territory from the newly acquired provinces of Savoy and Nice; and the Sardo Corsican range, which belongs, as the name implies, to the islands of Sardinia and Corsica, and traverses the Corsican island from its extreme northern to its southern extremity. The highest peaks in the Pyrenees, the Maladetta and Mount Perdu, respectively attain an elevation of 10,886 feet and 10,994 feet; in the Cevenno-Vosgian range, the greatest height (the Widderkalm) does not greatly exceed 7000 feet. The French portion of the Alps now includes several of the highest mountains and most elevated passes of the range, as Mont Blanc, 15,744 feet; Mont Iseran, 13,272 feet; Mont Cenis, 11,457 feet; and the pass of Little St Bernard, 7190 feet; that of Mont Cenis, 6770 feet above the level of the sea, &c. In Corsica, the highest peak rises to an elevation somewhat above 9000 feet. The grand water-shed of F. is the Cevenno-Vosges chain of mountains, which determines the direction of the four great rivers, the Seine, the Loire, the Garonne, and the Rhone; the first three of which flow north-west into the Bay of Biscay or the English Channel, and the fourth into the Gulf of Lyons. Besides these, the more important streams are the Rhine (as a boundary river), the Moselle, Meuse, and Scheldt or Escaut (all of which soon leave France, and flow into the Netherlands, or Rhenish Prussia); the Somme and Orne (belonging to the basin of the Seine); the Vilaine and the Charente (belonging to the basin of the Loire); and the Adour (rising in the Pyrenees, and flowing into the Bay of Biscay at the extreme south-west of France). The Oise, the Aube, the Yonne, and the Marne are the chief affluents of the Seine; the Sarthe, the Loir, the Allier, and the Cher, of the Loire; the Dordogne, the Lot, the Tarn, and the Gers, of the Garonne; and the Saone, the Isere, and the Durance, of the Rhone.

The entire extent of river-navigation in F. amounts to 5500 miles, or 8,900,000 mètres, while the 99 larger canals, which have been constructed either to connect these river-courses or to supply entirely new channels of water-communication, extend over a length of 2900 miles, or 4,700,000 mètres. The most important of these works are the canals connecting Nantes, and Brest, and the Rhone with the Rhine, and the canals of Berry, Nivernais, and Bourgogne. F. possesses only one lake of any importance, Le Grand-Lieu, a little to the south of Nantes, which has an area of about 14,300 acres; but the country abounds in salt marshes or ponds, more especially in the districts of Gascony, Roussillon, and Languedoc.

F. is peculiarly rich in mineral springs, of which there are said to be nearly 1000 in use. Of these, more than 400 are situated in the group of the Pyrenees, where there are 93 establishments for their systematic use. It is estimated that there are, moreover, fully 4000 springs not hitherto employed.

Geology, &c.—F. presents a great variety of geological formations, but although we meet with an almost complete succession of all the stratified and non-stratified strata, they are distributed with great inequality. Thus, for instance, while nearly one-third of the soil is composed of tertiary formations, a mere fractional part only is made up of coal-beds. A belt of primary rocks, forming the skeleton of some portions of the Vosges, Alps, and Pyrenees, and of the great plateaux of Brittany and La Vendée, encircles the great central basin in which rises the volcanic formation of the mountains of Auvergne, with their extinct craters, lava streams, &c. The spaces between this external breast-work and its volcanic nucleus is occupied by secondary and tertiary formations. Alluvial deposits are met with in all the valleys, but they occur in extensive beds only in Alsace, in the neighbourhood of Dunkirk and Niort, and on the borders of the Mediterranean. According to M. Maurice Block's estimate, the physical and agricultural character of the soil of F. may be comprised under the following heads:

	Hectares.
Mountainous districts, heaths, and commons,	9,944,839
Rich land,	7,276,369
Chalk or lime districts,	9,788,197
Gravel, stony, and sandy,	15,951,618
Clay, marshy, miscellaneous,	9,807,577
	52,768,600

The same writer further subdivides the soil of F. according to its actual employment; the following are some of the heads:

	Hectares.
Arable lands,	25,500,075
Meadow lands,	5,159,179
Vineyards,	2,088,048
Woods,	7,688,286
Orchards, gardens,	627,704
Olive, mulberry, and almond woods,	109,264
Chestnut woods,	559,029
Roads, streets, public walks, &c.,	1,102,122
Forests and unproductive lands,	1,047,684

Climate.—F. possesses one of the finest climates in Europe, although, owing to its great extent of area, very considerable diversities of temperature are to be met with; thus, for instance, the north-east parts of the country have a continental, and the north-west parts an oceanic climate, resembling those of Germany and Great Britain; while the Mediterranean districts are exposed at times to the ravages of the burning winds which have passed over the deserts of Africa, and to the destructive north-west wind known as the *mistral*, which often does great injury to the fields near the mouths of the Rhone and Var. The parts of F. lying south of lat. 46° have about 134 rainy days in the year, and those north of that parallel about 120. The mean annual temperature of different parts of F. has been estimated as follows by Humboldt: Toulon, 62° F.; Marseille, 59·5°; Bordeaux, 56°; Nantes, 55·2°; Paris, 51·2°; Dunkirk, 50·5°.

Products.—Of the vegetable products of F., which, from varied climatic and geognostic relations, are necessarily characterised by great abundance and diversity, the most generally cultivated are the cereals, the vine, chestnuts, olives, culinary fruits, and vegetables, hops, beet-root for the manufacture of sugar, tobacco, madder, chicory, flax, &c. During the 40 years between 1819 and 1858, the supply of wheat has 22 times fallen below the demand, and 18 times risen above it. The cultivation of wheat has gradually increased during the period already referred to, but that of rye, barley, and maize has exhibited little variation; while the growth of potatoes has been most extensively augmented during the same period. The following table shews the fluctuations to which these alimentary substances have been subjected;

	EXTENT OF LAND OCCUPIED IN 1815, 1830, 1845, AND 1857.				QUANTITY YIELDED IN 1815, 1830, 1845, AND 1857.			
	1815. Hectares.	1830. Hectares.	1845. Hectares.	1857. Hectares.	1815. Hectolitres.	1830. Hectolitres.	1845. Hectolitres.	1857. Hectolitres.
By Wheat,	4,591,677	5,011,704	5,743,135	6,639,688	39,460,971	52,782,098	71,963,280	109,989,747
〃 Rye,	2,500,000	2,500,000	2,500,000	2,000,000	25,700,000	32,440,000	30,000,000	28,900,000
〃 Barley,	1,100,000	1,100,000	1,200,000	1,110,000	14,600,000	17,600,000	18,400,000	21,178,000
〃 Maize,	514,513	593,000	730,000	680,000	5,630,000	6,600,000	8,000,000	9,865,095
〃 Potatoes,	600,000	800,000	925,000	957,000	21,600,000	54,835,167	77,900,000	101,366,867

The mean annual yields of these productions may be estimated as follows: Wheat, 73,000,000 hectolitres;* rye, 22,000,000 hectolitres; barley, 20,000,000 hectolitres; maize, 9,100,000 hectolitres; potatoes, 95,000,000 hectolitres. This decided increase in the amount of land devoted to wheat, and the increased returns, afford evidence of the great improvement which has characterised the agriculture of F. during the last 20 years. The subdivision of farms; the short leases (of less than 10 years) on which the majority are let; and the small number of landed proprietors who reside on their own estates, have hitherto tended to check the progress of agriculture in France. The present government is, however, bestowing its careful attention on the interests of the agricultural class. Agricultural exhibitions have been held since 1850; 360,000 francs are annually given in prizes, &c.; and there are now 740 agricultural associations in different parts of France.

The manufacture of sugar from beet-root, which took its origin during the great wars of the early part of the century, has been prosecuted with much vigour during the last 30 years, and about 150 millions of kilogrammes* are annually manufactured. Since the appearance of the vine-disease, beet-root has been extensively employed in the manufacture of alcohol; and in 1857, the quantity prepared amounted to 429,000 hectolitres. The cultivation is almost limited to the north and east; hemp and flax are grown chiefly in the northern, but also in the south-western départements. The entire production of hemp was estimated in 1842 at 67,507,076 kilogrammes, worth 86,287,300 francs; and that of flax at 36,875,400 kilogrammes, worth 57,507,400 francs. Since that period, there has been little difference in the home production, but an enormous increase in the importation of foreign flax, as the following table sets forth:

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* The hectolitre = 2·75 bushels.

* The kilogramme equals 2·2 lbs. avoirdupois.

QUANTITY IMPORTED.

	Kilogrammes.	Francs.
1847, ...	13,811,684	17,264,605
1852, ...	26,580,386	33,228,480
1857, ...	19,770,442	25,701,885

The cultivation of the mulberry-tree derives importance from its bearing on the production of silk. In 1842, 41,275 hectares of land were planted with these trees in 38 of the départements of the west. In 1858, the département Du Gard had monopolised nearly half the culture of these trees, which in its aggregate amount has continued unchanged. From its connection with the mulberry, we here refer to the production of silk, which began at the opening of the 17th c., and which in 1790 had reached such vast dimensions, that the produce at that period was already 6½ million kilogrammes of cocoons, worth 16½ million francs. Since that period, it has exhibited great variations. From 1840 to 1853, the production continued steadily to increase from 17 to 26 millions of kilogrammes; but the diseases to which the silk-worm has been liable since that period have reduced the yield of silk to so great an extent, that in 1857 it scarcely amounted to 7 millions of cocoons.

The vine has, from a very early period, constituted one of the principal sources of the agricultural wealth of France. The choicest wines are grown in the Bordelais, Burgundy, and Champagne, but some excellent kinds are produced on the banks of the Loire, and in some of the southern départements. The cultivation of the vine increased, between 1788 and 1829, from 1,546,615 to 1,989,399 hectares; but between 1849 and 1857, it fluctuated from 2,192,939 to 2,180,096 hectares. The mean produce for every hectare was, in 1788, 21 hectolitres 21 litres; in 1829, 27 hectolitres 20 litres; in 1850, 32 hectolitres 35 litres. Since that date, however, the fungus known as the oïdium, which has attacked the vine, has inflicted such serious damage on the plant, that in 1854 (the worst year, it must be admitted) the hectare yielded only 5 hectolitres. The following table will shew some of the annual yields between the years 1808 and 1858:

PRODUCTION OF WINE.

	Hectolitres.		Hectolitres.
1808, ...	28,000,000	1850, ...	44,717,553
1829, . . .	30,973,000	1854, .	10,789,869
1848, ...	51,622,150	1858, ...	45,805,000

The average yearly produce of the vineyards of F. is estimated at 42 millions of hectolitres (about 924 millions of gallons). Of this, about 1/7th is made into brandy. The mean price of the hectolitre on the spot was, in 1788, 15 francs 44 centimes; in 1810, 19 francs 90 centimes; in 1830, 16 francs 86 centimes; in 1850, 12 francs 97 centimes.

The principal forest trees are the chestnut and beech on the central mountains, the oak and cork tree in the Pyrenees, and the fir in the Landes. The destruction of the national forests has been enormous within the last two centuries, but measures have been in contemplation in recent years to plant wood, in order to protect those mountain slopes which are exposed to inundations from alpine torrents, and to provide a supply for the ever-increasing demand of wood for purposes of fuel. About 1/7th of the entire territory of F. is still covered with wood. Turf taken from the marshy lands is extensively used, more especially in the rural districts, for fuel.

Animals.—F. is not so well stocked with domestic animals as her great resources might warrant us in assuming that she ought to be; but the impetus that has marked the progress of agriculture within the last 30 years has been extended to the improvement of all native breeds, and the introduction of the best foreign races. In 1812, the number of horses and mules was estimated at only two millions. In 1850, this number had risen to three millions; and it is believed that the increase has been proportionally great since that period. Asses and mules are employed as beasts of burden, but it would appear that their use is slightly on the decrease; thus, for instance, there were in F., in 1839, 373,841 mules and 413,519 asses; while according to the last census taken of these animals in 1852, and published officially in 1858, there were in that year only 327,720 mules and 398,249 asses. During the 40 years intervening from 1812 to 1852, the numbers of horned cattle have almost doubled in France. In 1852, the date of the last census, there were in F. 12,159,807 horned cattle, 33,510,531 sheep, 5,000,000 swine, 1,385,940 goats. There are, according to the *Statistique Agricole* for 1858, about 2½ millions of bee-hives, valued at rather more than 16½ millions of francs; the mean annual returns are, for honey, 6,670,000, and for wax, 1,620,000 kilogrammes. Poultry constitutes an important item of farm-produce in F., estimated at 40½ millions of francs; while the eggs and feathers yield 35¼ millions of francs. The wild animals are fast diminishing from the soil of F., and the black and brown bear is now limited to the higher ranges of the mountains; the lynx is rarely seen, even among the higher alpine regions, but wolves are still numerous in the mountainous districts of the central départements; while the chamois and wild-goat, as well as the marmot, ermine, and hamster, are found among the Pyrenees, Alps, and Vosges. The wild-boar, roebuck, fox, squirrel, polecat, and marten are to be met with in the woods. The red and fallow deer are scarce; hares and rabbits abound, and game generally is plentiful. The wanton destruction of small (singing) birds having been found to be conducive to the excessive increase of noxious insects, stringent municipal enactments have been issued within the last year for the protection of those birds.

Fisheries.—The French government expends between three and four millions of francs annually in aiding those engaged in the great fisheries; and in 1858, 525 vessels, with 67,929 tonnage, and 12,530 men, were engaged in the whale and cod fisheries. According to official reports, 15,500 persons are employed in preparing and salting fish. In 1858, the imports of fish amounted to 21½ and the exports to 12 millions of francs. Of these, cod constituted the principal item. There are no official reports of river and other fresh-water fishing in F., or of the minor fisheries carried on along the coasts, although the latter constitute the principal means of occupation and support of the majority of the population in the maritime départements. Pilchards and mackerel are caught in large quantities off Normandy and Brittany. The west coasts have extensive oyster and mussel beds; tunnies and anchovies are caught on the shores of the Mediterranean.

Mineral Products.—The chief mineral products of F. are coal and iron, in the excavation of which 179,825 men were employed in 1850. Although F.

is not rich in coal, it possesses several very considerable coal-beds, which are situated principally in the east-south-east and north. In 1852, 448 coal-mines had been opened (of which only 286 were in operation), having a square area of 4776 kilomètres. The supply hitherto has not equalled the demand; and in 1858, F. imported from the German Confederation, Belgium, and England, 45½ millions of quintals* of coal. The entire consumption in 1852 was 120 millions of quintals. The iron mines of F. are of excellent quality, but their distance from the fuel necessary for the working of the mineral, renders them of relatively small value. In 1847, there were 101 mines in operation, from which 34½ millions of quintals were taken; more than half of this quantity being obtained from the five départements of Haute-Marne, Haute-Saône, Cher, Moselle, and Nord. The political disturbances of 1848 had a very depressing effect on all branches of metallurgical industry, which has scarcely been removed at the present time. F. imports iron from Switzerland, Germany, Belgium, and England. Argentiferous galena, a little silver and gold, copper, lead, manganese, antimony, and tin occur, but hitherto their working has not proved very productive. The département of Charente-Inférieure yields the largest amount of salt, the mean annual produce being 1½ millions of quintals (2½ millions of francs), which is fully one-third of the entire annual produce of the whole country. F. derives about 41 millions of francs from its quarries of granite and freestone, its kaolin, marbles, sands, lithographic stones, millstones, &c. Granite and syenite are found in the Alps, Vosges, Corsica, Normandy, and Burgundy; porphyry in the Vosges, and basalt and lava for pavements in the mountains of Auvergne. Marble is met with in more than 40 départements; alabaster occurs in the Pyrenees; the largest slate-quarries are situated near Cherbourg and St Lô.

The following list gives an approximative estimate of the value of the chief products of French industry:

	Francs.
Hemp, flax, cotton, wool, silk, ...	3,000,000,000
Mixed fabrics, laces, embroideries, articles of dress, ...	1,800,000,000
Mines, quarries, iron, and other mineral works,	711,600,000
Jewellery, watches, clocks, ...	200,000,000
Articles of food—as sugar, &c., ...	364,500,000
Skins, leather, oils, ...	556,250,000
Bone, ivory, isinglass, &c., ...	30,000,000
Chemical products, ...	80,000,000
Ceramic arts, ...	86,000,000
Paper, printing, ...	60,000,000
Forests, fisheries, ...	98,000,000
Total, ...	6,986,350,000

The principal seats of industry are as follows: For textile fabrics, the départements Le Nord, La Sarthe, Maine-et-Loire, Seine-Inférieure, Le Calvados, Seine-et-Oise, Ille-et-Vilaine, &c.; employing (in 1852) 969,863 workmen, 1004 steam-engines, 305,968 looms, and 5,094,839 shuttles. F. stands unrivalled for her silk manufactories, the finest of which are at Lyon, Tours, and Paris. The département La Loire, and more especially the manufactory of St Etienne, is the special seat of the ribbon trade. Alençon, Bailleul (fabricating the so-called *Valencienne*), Lille, Arras, Caen, and Bayeux, are all famous for their laces and blondes, which alone occupy 250,000 persons. Rheims stands conspicuous for its *merinos* and fine flannels; Amiens and Alsace for their fine printed woollen goods; Lodève and Elbœuf for army cloths. Gloves are made at Grenoble, Paris, &c. The best carpets are made at Aubusson, Abbeville, and Amiens. Paris is the seat of industry for some of the most costly fabrics, as Gobelins Tapestry, shawls of great value, watches, clocks, articles of *vertu*, carriages, philosophical instruments, &c. Sèvres stands unrivalled for its china and glass. St Gobain and St Quirin manufacture looking-glasses of the largest size.

The trade of F. is inferior only to that of England and the United States, and her favourable position in having the command of the three most important maritime thoroughfares in the world, would seem to place the future supremacy of commerce within her reach. The great emporiums of trade are Paris, Lyon, St Etienne, Lille, Rheims, Mülhausen, Nîmes, Toulouse, St Quentin, Orleans, Avignon, Montpellier, &c.; and the most active maritime ports are Marseille, Cette, Havre, Bordeaux, Nantes, Rouen, Calais, Dunkirk, Boulogne, Dieppe, &c. These centres of trade have all suffered at different periods during the present century, from the political disturbances under successive governments; but notwithstanding these drawbacks, the commercial activity of the country has made rapid strides within the last 30 years. The following table shews the condition of trade during four years of the old monarchy, when, however, it must be remembered that one-third of the entire trade was composed of exchanges with the colonies:

Years.	Value of Importations in millions of francs.	Value of Exports in millions of francs.	Total.
1787, ...	551	440	991
1788, . . .	517	466	983
1789, ...	577	441	1018
1792, . . .	929	803	1732

While the rate of this progress during five years preceding 1859 has been as follows:

Years.	Importations in millions of francs.	Exportations in millions of francs.	Total.
1854, . . .	2867	3049	5916
1855, . . .	3318	3469	6787
1856, . . .	3788	3947	7735
1857, . . .	3686	3997	7683
1858, . .	3419	4219	7638

The ships employed in the import trade are about 30,000 (3½ million tons), and those in the export trade, 26,000 ships (2½ million tons). The transit trade of F. is effected by maritime navigation between foreign and French ports, by coasting traffic, or *cabotage*, between various French ports, and by railways. The merchant navy, which has increased extensively of late years, numbered, in 1858, 19,805 vessels, having a tonnage of 2,987,000; of the latter number, 324 were steamers, and 15,187 were vessels carrying both sails and engines. The *cabotage*, or internal and coasting traffic, is a great source of financial wealth to the state, to which all rivers and canals belong. There is a length of 13,155 kilomètres available for inland navigation in France, but, according to an official report of 1860, three-fourths of the entire traffic is concentrated upon 1800 kilomètres of this length. In the year 1857, 51,522,492 tons (of 1000 kilogrammes the ton) of goods were conveyed by this inland water communication in 95,274 boats, with 3,389,983 tons, and employing about 500,000 men. Of this number, 73 per cent. belonged to the ocean ports, and 27 per cent. to the Mediterranean.

According to the latest official report, the railways in operation measure 9100 kilomètres; and those in contemplation 7000 kilomètres; making a total length of about 10,000 miles. The cost of all the lines up to 1858 was 3,660,433,780 francs, more than one-third of which was expended from 1855 to 1857. The total receipts of all the lines were, for 1858, 334,769,469 francs; for 1859, 387,562,239 francs. The total number of passengers conveyed by rail in 1857 was 37,952,398. Of every 100 of these, 10 were by first class; 20 by second class; and 70 by third class. The mean cost is 6 centimes the kilomètre, or about 10 centimes the mile. The creation of the first high-roads in F. is referred to Philippe Auguste; and their more perfect organisation in the 16th and 17th centuries, to Henry IV. and Louis XIV. Under Napoleon, there were 125 high-roads, extending in all over 31,814 kilomètres; and in 1859 there were 655 imperial roads (36,150 kilom.), 265,000 departemental roads (1,228,000 kilom.), with 2000 bridges, and a length of 1500 kilomètres.

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* The quintal equals 1·97 cwt.

Postal Service.—The postal service in F. goes back to the year 1464, when Louis XI. placed it on a systematic footing, under the direction of the state. Since 1848, a uniform rate of postage of 20 centimes has been fixed for all letters for F. and Algiers, independently of distance. In 1859, there were 217,555,450 stamps sold, which brought a return of 40,000,000 of francs. The whole receipt of the postal service is nearly 60,000,000 of francs.

Electric Telegraph.—The first electric telegraph was constructed in F. in 1844, and F. is now intersected by a close net-work of wires, which flash communications between Paris, as the central focus, and every part of the empire. In 1859, the lines measured 13,030 kilomètres, and the profits realised were 3½ millions of francs.

Constitution, Administration, &c.—The imperial government was re-established in F. by a *senatus-consultum* in 1852, ratified by the popular vote or *plebiscitum.* The imperial dignity was, by virtue of the same acts, conferred upon Louis Napoleon Bonaparte, who bears the title of Napoleon III., Emperor of the French. The political organisation of the empire was regulated by the constitution of the 14th of January 1852, which decreed that the emperor should govern with the aid of ministers, a council of state, a senate, and a legislative body; and that the powers wielded by these several bodies should be both legislative and executive; the former to be exercised collectively by the emperor, senate, and legislative chamber; and the latter to be vested exclusively in the hands of the emperor, and by him delegated to administrative and judiciary officers. The emperor is the chief of the state, he commands the naval and military forces, declares war, and settles treaties of peace, alliance, and commerce. He nominates to all employments; justice is administered in his name, and he has the right of granting pardons and amnesties. According to article 6 of the constitution of 1852, 'the emperor is alone responsible to the French people, to whom he has at all times the right to appeal.' The ministers depend only upon him, and each has merely a limited responsibility in regard to his own department. All public officers, from the chief ministers to the lower functionaries, tender an oath of fidelity to the emperor. The civil list is to be fixed at the commencement of every reign; and, according to the decree of January 19, 1853, the emperor is to receive 25,000,000 of francs annually, and the princes and princesses of the imperial family 2,500,000 francs each. The imperial dignity is hereditary in the male descendants of the emperor; and in default of these, in the male line of descent from the brothers of the Emperor Napoleon I. The senate is composed of cardinals, marshals, and admirals, chosen for life by the emperor. Their number is limited to 150, and they receive each an annual allowance of 30,000 francs. The meetings of the senate are not public, and they are convoked and prorogued at the emperor's will. No law can come into force till it has been ratified by the senate; and in the event of the dissolution of the legislative chamber, it rests with this body to provide for the proper administration of public affairs. The deputies of the legislative chamber are elected by universal suffrage, the votes being taken without public scrutiny, and without any open examination of the lists of voters. They are elected for six years, and receive 2500 francs a month pending the sessions. The emperor convokes, prorogues, and dissolves the chamber, but the constitution requires that in case of its dissolution, a new chamber shall be convoked within six months. The number of the deputies fluctuates with the population, each département with 35,000 inhabitants having one deputy; or two deputies where there is an excess of 7500 over the required 35,000. The total number has been fixed for 1857—1862 at 267. The *council of state* is composed of the emperor and the members of his family, a president and a vice-president, and about 150 councillors, auditors, &c., all named by him. It is a mixed justiciary and administrative body, acting as a court of appeal and ultimate decision from other branches of the legislature. There are ten ministers of state named by the emperor, who dismisses them at his pleasure. These ministers preside over the several departments or bureaus into which the government has been divided, and are responsible to the emperor alone.

Départements, &c.—Inclusive of the newly acquired territory, F. is divided into 89 *départements,* comprising 373 *arrondissements,* 2938 *cantons,* and 37,510 *communes.* Each département is presided over by a préfet, nominated by the emperor on the presentation of the minister of the interior; each arrondissement by a sub-préfet; each canton by a member at the general council of the département which meets annually for whatever period the emperor may decree; and every commune has its *maire* and municipal council. Every chief town of a canton has its commissary of police; in the larger towns, there must be one of these officers to every 10,000 inhabitants. The administration of justice is presided over by a special minister of state, who is keeper of the seals. A supreme tribunal serves as a court of appeal from the lower courts. The tribunals of commerce and police, together with those of the several départements, take cognizance of the various civil and criminal cases specially falling within their several spheres. There are 361 tribunals of the arrondissements, or *tribunaux de première instance,* which are divided into six classes; 2681 police courts; 218 tribunals of commerce; 27 imperial courts, divided into four classes; a *Cour de Cassation,* divided into three chambers, which confirms or annuls the sentences of the police and assize courts; and a *Haute Cour de Justice,* which gives final judgment in all cases of *lez-majesté,* or other offences against the state. Assizes are held every three months in 59 towns; and, independently of the ordinary judicial magistrates, the courts of assize are composed of juries of twelve men, chosen in accordance with certain prescribed regulations. In the maritime and commercial towns there are also councils of *prud'hommes* (experienced men), with summary jurisdiction in matters to the amount of 100 francs. These councils, which are composed of master-workmen elected annually, decide several thousand cases in the year in the larger cities. There were 9712 notaries in practice in F. in 1857. The state is charged 28⅓ millions of francs annually for the expenses incident to the ministry of justice. There are 387 départemental prisons, 21 central houses of detention, 2 political prisons at Doullens and Belleisle, and numerous penitentiaries and reformatories for the young. All these prisons, excepting the two for political offenders, are in part self-supporting. The three hulks or *bagnes* of Brest, Rochefort, and Toulon contained, in 1859, only 2700 convicts, and it was determined by a decree issued in 1852, that they were to be ultimately broken up, and that the prisoners were for the future to undergo their sentence in French Guyana (q. v.).

Religion, Churches.—The principle proclaimed in 1789, 'that no person can be molested in F. on account of his religious opinions, provided the manifestation of them does not disturb the public peace as established by law,' has been confirmed by the constitution of 1852. The public exercise of any special form of religion must, however, be preceded by the official authorisation of the préfet, or in special cases, by that of the emperor in council. The *recognised* forms of faith are—the Roman Catholic, the Protestant (including the Reformed and Lutheran), the Jewish, and, for Algiers, the Mohammedan. The clergy attached to these religions receive their pay from the state, and are exempt from military service. The Roman Catholic church embraces the great majority of the people. Of the 37,000,000 which constitute the present population of F., 1,500,000 appertain to the two Protestant churches, 150,000 to the Jewish persuasion; and 25,000 to non-recognised but tolerated denominations, the Anabaptists comprising nearly one-third of this number.

At the breaking out of the Revolution, the annual revenues of the church amounted to 150,000,000 of livres, and its debts to 133,000,000. The state appropriated to itself the funds of the church in 1789, and assumed the responsibility of maintaining public worship. The following table gives a summary of the expenses incurred by the state for the maintenance of religion since the Consulate.

Years.	Catholic Religion.	Protestant Church.	Jewish form of Faith.	Moham. Rel. in Algiers.
	Francs.	Francs.	Francs.	Francs.
1803, . .	4,059,006	22,363		
1813, . .	16,628,868	695,000		
1823, . .	26,138,445	577,829		
1835, . .	33,523,319	849,763	79,995	3,000
1847, . .	37,630,008	1,240,229	108,836	3,000
1854, . .	42,223,329	1,328,891	149,428	568,024
1859, . .	44,994,100	1,408,436	189,400	830,200

The archbishops and bishops of the church of F. are nominated by the emperor, and canonically inducted by the pope. There are 16 archbishops and 65 bishops. The Archbishop of Paris receives 50,000 francs per annum; the other archbishops, 20,000 francs: the bishops, 15,000 francs. Six French prelates hold the rank of cardinals, to which dignity they are nominated by the pope on the presentation of the emperor. Every archbishopric has 3, and every bishopric 2, vicars-general, the whole number being 177. Their salaries vary from 3500 to 4500 francs. There are 669 canons belonging to the various cathedral chapters, receiving from 1600 to 2400 francs per annum; and there is a special chapter at St Denis, instituted to have charge of the graves of the ancient kings of F., and intended, moreover, to serve as a retreat for ecclesiastics renowned for learning or science. There are at present 3424 *curés* or parochial beneficed clergy, who are canonically inducted by the bishops, under the approval of the state; and 29,971 curates or assistants. The *curés* receive from 1200 to 1500 francs; the curates, 200 francs. The *curés* may be assisted by a certain number of vicariats, who receive from 350 to 500 francs; there are at present 8050 authorised by the state. There are 82 large, and 130 smaller seminaries, for the education of the clergy, with 27,290 pupils. There are also 22 establishments maintained by the state for the education of nuns and sisters of charity. It is computed that the number of men and women who lead a cloistered life is as great now as before 1792. There are in F. 105 Reformed consistories, and 44 belonging to the Lutheran Church. The central council of the reformed churches holds its sittings at Paris. Synods composed of the delegates of five churches may assemble with the authority of the state to regulate the celebration of the services of their church; but their meetings cannot last longer than six days, and their decisions must be submitted for the approbation of the government. There are two Protestant seminaries, one for Lutherans at Strasbourg, and the other for the Reformed at Montauban.

Public Instruction.—Public instruction is presided over in F. by a special ministry. Nearly half the expenses connected with it are defrayed by the state, and the remainder by the départements. There are 16 academies located in the following towns—Aix, Besançon, Bordeaux, Caen, Clermont, Dijon, Douai, Grenoble, Lyon, Montpellier, Nancy, Paris, Poitiers, Rennes, Strasbourg, Toulon. These academies are divided into the five faculties of theology, law, medicine, sciences, and literature, and supplemented by various superior and preparatory schools. The professors are paid partly by the state, and partly by fees. There are superior normal schools intended to train teachers for the higher departments of instruction. Secondary instruction has received an immense impetus during the present century. There are 69 normal schools for teachers of public and primary schools. The number of primary communal schools for boys has also increased in a remarkable degree since the Revolution of 1830. In 1833, there were 22,640 primary public schools; in 1857, 36,500; besides which there were 3500 *free* primary schools for boys. Of the above 36,500, 18,000 were mixed schools admitting girls. There were, moreover, 11,500 free schools for girls, and 14,000 communal schools for their use, more than half of which are under the management of religious sisterhoods. In 1857, about one-fifth of the entire number of boys, and one-fourth of the girls, between the ages of seven and thirteen, received no primary education. The different départements share very unequally in the diffusion of education, and it may be generally observed that the proportion of the educated is highest in the central and western départements, and lowest in the eastern départements, on the German frontier line. F. supports numerous colleges and schools for instruction in special branches of knowledge: as L'Ecole des Chartes; des Langues Orientales; des Beaux-Arts, founded in 1671 by Louis XIV.; de Dessin, founded in 1766 by Louis XV.; the Conservatoire de Musique, founded in 1784; L'Ecole de Rome, founded by Louis XIV., and L'Ecole d'Athènes, founded in 1846; L'Ecole des Ponts et Chaussées, for the instruction of engineers of public works; L'Ecole des Mines (1783); the Conservatoire Impérial des Arts et Métiers, for the application of science to the arts and trades; the central school, des Arts et Métiers; and the imperial schools for arts and trades, designed to give superior instruction to handicraftsmen in their own special branches of industry. There are, moreover, numerous agricultural, forest, farming, and veterinary schools, besides the Ecole Polytechnique, specially designed to prepare youths for the public services; and lastly, the military and naval colleges at St Cyr, Saumur, Paris, Vincennes, Brest, Toulon, and St Denis.

Literary and Scientific Institutions.—Among the literary and scientific institutions of F., the first is L'Institut de France (q. v.). The Museum of

Natural History, known formerly as the Jardin du Roi, is one of the finest in the world. The Bureau des Longitudes and the Observatoire, at Paris and Marseille, have occupied the first rank among scientific institutions since their foundation. These establishments are all maintained at the cost of the state. Paris possesses several libraries belonging to and supported by the state, but freely opened to the public. The most important of all is that now known as La Bibliothèque Impériale. See Libraries. There are 338 public libraries in the provinces, to all of which access is afforded in the most liberal spirit. F. is rich in public galleries of painting, statuary, and articles of *vertu*. The Musée du Louvre, Musée de Versailles, and du Luxembourg at Paris, are rich in the possession of some of the greatest gems of art still existing.

Theatres.—The theatre, like all other public institutions, is under the surveillance of the state, which charges the annual budget for the maintenance of theatrical companies. There are twenty-two licensed theatres in Paris, and fifty in the provinces, besides numerous itinerant troupes. The opera alone receives 820,000 francs from government, and the other Parisian theatres about 600,000 francs. Since 1850, all dramatic works have been again subjected to the control of the censor.

Press.—The press is also under the same censorial restrictions, and every printer and bookseller must furnish guarantees of character, &c., before he can print or publish any paper or book. From 1851 to 1858 inclusive, there were 77,650 books and pamphlets printed in F.; there are at present 263 political, and 1100 non-political journals printed, nearly one-half of which are issued in the département of the Seine.

Charitable Institutions.—F. is rich in institutions of charity, many of which are remnants of the old system of church relief; but the *crèches*, of which there are several hundred, and which are, in fact, free nurseries, where working-mothers may leave their young children during their hours of labour, are a modern form of charity, which originated (in 1844) with M. Marbeau at Paris. There were, in 1853, 1324 hospitals and infirmaries maintained by the proceeds of landed and funded property, a percentage on the receipts at theatres and other places of amusement, and by the government and the several local communes. These 1324 hospitals and infirmaries had 69,000 beds, of which 58,000 were free. Public charities for the relief of paupers derive their resources either from the state or the départements, or from municipal funds, and are administered by the *bureaux de bienfaisance*, of which there were, according to the latest report, 11,409, relieving 110,000 persons annually; by the *dépôts de mendicité;* and by numerous other local institutions.

Taxation, Finances.—The public revenues are obtained in F. from direct and indirect taxation, and the proceeds derived from state lands, &c. The following table shews the financial report of the public receipts and expenditure for different years from 1815 to 1859:

Years.	Receipts = francs.	Expenditure = francs.
1815, ...	743,830,200	798,590,859
1824, ...	994,971,962	992,583,233
1830, ...	1,031,796,054	1,095,142,115
1835, ...	1,038,102,801	1,047,207,680
1840, ...	1,234,483,099	1,363,711,102
1845, ...	1,393,286,845	1,489,432,101
1850, ...	1,431,622,471	1,472,537,238
1855, . . .	2,793,273,965	2,399,217,840
1857, . . .	1,799,225,838	1,872,526,217
1859, ...	1,766,080,877	1,773,919,114

Public Debt.—The following table shews the fluctuations which the interest on the national debt, including dotations charged to the civil list, has undergone at various periods from 1830 to 1860:

Years.	Francs.	Years.	Francs.
1830, . . .	349,935,534	1852, .	415,332,776
1835, . . .	344,015,052	1854, . . .	454,241,667
1840, . . .	352,966,196	1856, . . .	550,769,522
1845, . . .	383,998,729	1858, . . .	562,478,136
1850, . . .	398,088,890	1860, . . .	602,128,070

The public debt has been greatly increased in consequence of the imperial government having raised enormous loans within the last five or six years. The necessities of the war in the Crimea led to the authorisation of three loans—the first for 250, the second for 500, and the third for 750 millions of francs in 1855. These loans were effected by public subscriptions, furnished in response to the appeal made by the emperor to the nation at large. Subscriptions of ten francs or multiples of ten francs were received, and so successful was the appeal, that 600,000 persons pressed forward with tenders to the value of 4740 millions of francs, which had to be reduced more than two-thirds. In 1859, a new loan of 500 millions of francs was effected on the same principle. At the present date (1862), the floating debt, including the interest on these loans, amounts to 920 millions; while the capital of the consolidated debt represents a value of 8600 millions of francs.

Army.—Standing armies date in F. from the time of Charles VII. The law of 1832 regulated the system of recruiting by conscription, on the footing which, with few modifications, it has subsequently occupied. The annual contingent, which since 1856 has been fixed by law at 100,000 men, is made up year by year by the drawing of lots in each commune among the young men whose names are on the rolls as eligible for service. The standard of height (1860) is 1 mètre 56 cent. (about 5 feet 1 inch), which is 2 cent. less than that required under Napoleon. Exemption from service may be obtained by the payment of a certain fine. Prior to the Revolution of 1789, the army when on a footing of peace amounted to 256,051 men, maintained at an annual cost of 125 millions of francs. At the beginning of the Empire in 1808, the army consisted of 450,000 men, and cost the nation 350 million francs; and the budget proposed for 1862 gives 400,000 men as the effective force to be maintained. Besides regular troops, F. has its *Garde Nationale*, which was created in 1789, and legally organised in 1791. Since 1852, the sphere of its obligations has been limited to the maintenance of order in case of threatened insurrection.

Navy.—The French navy has been very materially strengthened and augmented during the last ten years; and the extensive augmentations meditated in 1858 in this branch of the service will, it is calculated, bring the navy estimates year by year till 1872 (when it is contemplated that the works begun in 1857 will be completed) to 123 million francs. The inscription for the navy, which owed its systematic organisation to the great minister Colbert (1681), is regulated by various ordinances, the last of which bears the date of 1852. All persons engaged in any maritime avocation between the ages of 18 and 50 are liable to inscription, but the service is only compulsory for three years. There are 170,000 names on the rolls. Of these, 38,375 are on service during peace; in time of war, 60,000 may be called out. The fleet consists of 600 vessels afloat, or under transformation, carrying 13,353 guns; of these, 373 are steamers. There are 22,400 marines in peace, 26,879 in war, and 25,500 customs and coastguards men. F. has 6 dépôts for marine artillery, 3 foundries, and 2 manufactures for projectiles. There are special hospitals, schools, and libraries for the use of the navy.

Money, Weights, and Measures.—For the money, weights, and measures now used in F. see FRANC, MÈTRE, LITRE, GRAMME.

Algiers and the French Colonies.—As Algiers (which, according to the constitution of 1852, is not a colony, but an integral part of F.) has been already treated of in a separate article, we will only briefly recapitulate some few of the most important details in regard to its administrative and industrial condition. Since 1858, the direction of affairs in Algeria has been vested in a special ministry. The three provinces of Algiers, Oran, and Constantine are subdivided into civil territories or départements—at the head of each of which is a préfet, and a council of préfecture—and into military territories, each of which is commanded by a general of division, assisted by a special council. The administration of the law is conducted in accordance with the system established in the rest of the empire, excepting that there are in Algiers certain Mussulman courts, composed of *cadis* and *medjlès*, which take cognizance of civil and commercial actions between natives. In 1859, the receipts of the state were 20,500,000 francs; in the same year, the expenses of the state were 18,000,000 francs, leaving a surplus of 2,500,000 francs.

Algiers has proved a most efficient training-school for the French army, and almost every regiment has in turn been stationed there. The average number of troops in the country, when there is no warlike demonstration on the part of the subjugated chiefs, is as follows: Officers, about 3700; men, about 78,000; in all, 81,700; and about 17,000 horses. There are on an average 550 gendarmes (109 brigades); 225 commissaries and agents of police; and 430 custom-house, coastguard, and other protective officials. There are between 400 and 500 schools, including primary and secondary instruction, at which 27,000 children attend. The teachers are principally members of religious orders. The principal raw products are tobacco, of which 4,500,000 kilogrammes were sent to F. in 1858; cereals, of which considerable quantities are exported in some years to Spain, &c.; the latter crops are, however, uncertain. Silk and cotton are being cultivated, but not as yet with any great success; 2000 hectares were devoted to the growth of cotton in 1858. Coral was formerly found in large quantities off the coasts of Algiers, and after various fluctuations, the produce of the year is now about 33,000 kilogrammes (4,250,000 francs). In 1857, there were 150 vessels, chiefly Italian, engaged in this trade. There is a bank established with government securities at Algiers, which has branches in the provinces.

The administration of the French colonies has, since 1858, been placed under the ministry of Algerine and colonial affairs, assisted by a consulting committee composed of four members, nominated by the emperor, and one delegate from each of the colonies of La Martinique, Guadeloupe, and Reunion (q. v.), elected for three years. In the larger colonies, the administrative power is vested in a governor, who exercises supreme military command, and is assisted by a general council, specially charged to vote the budget of the province. Three officers act under the orders of the governor—viz., the 'ordonnator,' director of the interior, and procurator-general. There is also in each colony a colonial controller, who presides over the financial and other departments of general administration.

In regard to the minor machinery of government, the colonies are organised on the model of the mother-country. There is at Paris a dépôt for colonial archives, in which copies of all registers, acts, and judgments referring to the various colonies, are open to inspection.

The state contributes 1,000,000 francs annually for the maintenance of Christian worship in the colonies, and 220,000 towards public instruction, which is partly gratuitous, and chiefly conducted by the clergy. Sugar, and coffee, and cotton constitute the principal sources of French colonial wealth. Slavery was virtually abolished in 1848, when it was decreed that no Frenchman, under penalty of forfeiting his rights as a French citizen, must own slaves in any country after a term of three years from that date. This term was afterwards extended to ten years, and expired in 1858. An indemnity of 126,000,000 francs has been paid to the French colonists for the enfranchisement of their slaves. See *Statistique génér. méthodiq. et compl. de la France*, by J. H. Schnitzler; *Dictions. et Annuaires de l'Administ. Franc.;* Dareste de la Chavaune, *Hist. des Class. Agricol. en France* (1858); Lejeun, *Géolog. de la France* (1858); *Statist. de la France* (M. Block, 1860); Lavergne, *Econom. Rurale* (1861); *Atlas Universel* (Babinet); *Géogr. de la France* (Oger).

History.—Gallia (Eng. *Gaul*) was the ancient name under which F. was designated by the Romans, who knew little of the country till the time of Cæsar, when it was occupied by the three races of the Aquitani, Celtæ, and Belgæ, who respectively inhabited the south-west, the west and central, and the north and north-east parts. There were also some tribes of Germans, Ligurians, and Greeks. It is probable that the Celts were the oldest race, for this people had sent forth colonies into Italy 600 B.C. The Greeks never penetrated far beyond the shores of the Mediterranean, where they planted colonies, the most important of which was Massalia (Marseille). The conquests of Cæsar reduced a great part of the country. Under Augustus, Gaul was divided into four provinces, which, under subsequent emperors, were dismembered, and subdivided into seventeen. In the decline of the Roman power, Gaul was ravaged by neighbouring hordes, and in the 5th c. it fell completely under the power of the Visigoths, Burgundians, and Franks. In 486 A.D., Clovis, a chief of the Salian Franks, and of the race of Merovingius, raised himself to supreme power in the north. His dynasty, known as the Merovingian, ended in the person of Childeric III., who was deposed, 752 A.D., after the kingly power had already passed into the hands of the former Maire du Palais, or mayor of the palace, Pepin d'Heristal, and, after him, into those of Charles Martel and Pepin le Bref. The accession of Pepin gave new vigour to the Frankish monarchy which, under his son and successor Charlemagne (768—814), rose to the rank of the most powerful empire of the West. Christianity, civilisation, and letters were protected during his reign, and before his death he had joined the crown of Lombardy to his other diadems, and had stretched the limits of his empire from the Eider and the German Ocean to the Ebro and the Mediterranean, and from the Atlantic to the Baltic. With him, however, this vast fabric of power crumbled to pieces, and his weak descendants completed the ruin of the Frankish empire by the dismemberment of its various parts among the younger branches of the Carlovingian family. Intestine wars desolated the land, and foreign assailants threatened it on every side. In 911 A.D., the ravages of the Northmen had assumed so persistent a character, that Charles le Simple was glad to purchase immunity from their encroachments by the cession of the territory subsequently known as Normandy. Anarchy reigned paramount; the various governors established an hereditary authority in their several governments, and the crown was by degrees deprived of the noblest part of its appanages. The power of some of the vassals surpassed that of the kings; and on the death of Louis V. the Carlovingian dynasty was replaced by that of Hugues, Count of Paris, whose son, Hugues Capet, was elected king by the army, and consecrated at Rheims, 987 A.D. At this period, the greater part of F. was held by almost independent lords, and the authority of the Capetian kings extended little beyond Paris and Orleans. Louis le Gros (1108—1137) was the first of the race who reinstated order. He promoted the establishment of the feudal system, abolished serfdom on his own estates, secured corporate rights to the cities under his jurisdiction, and gave efficiency to the central authority of the crown. A greater degree of general order was thus secured, while a new element in the state was generated by the foundation of a free burgher class. Louis carried on a war against Henry I. of England; and when the latter allied himself with the Emperor Henry V. of Germany against F., he brought into the field an army of 200,000 men, whose ready appearance afforded the first instance of the existence of a common national feeling of patriotism, ready to respond to the appeal of the sovereign. The *oriflamme* is said to have been borne aloft for the first time on this occasion as the national standard. Louis VII. (*Le Jeune*), who took part in the second crusade (1137—1180), was almost incessantly engaged in war with Henry II. of England. His son and successor, Philippe Auguste (1180—1223) recovered Normandy, Maine, Touraine, and Poitou from John of England, and increased the power of the crown in various other parts of France. He took an active personal share in the Crusades, and permitted the pope to organise a cruel persecution against the Albigenses in the southern parts of the country. Philippe was the first to levy a tax for the maintenance of a standing army, and in his reign a chamber of peers, of six secular and six ecclesiastical members, was instituted, to act as a council of state. Many noble institutions date their origin from this reign, as the university of Paris, the Louvre, &c. By the amendment of the administration of justice, the right of appeal to the royal courts was established, and the arbitrary power of the great vassals crippled. Improvements in the mode of administering the law were continued under his son, Louis VIII. (1223—1226), and his grandson, Louis IX. (1226—1270), who caused a code of laws (*Etablissements de St Louis*) to be promulgated. St Louis also effected many modifications in the fiscal department, and, before his departure for the Crusades, secured the rights of the Gallican Church by a special statute, in order to counteract the constantly increasing assumptions of the papal power. Under his son, Philippe III. (1270—1285), titles of nobility were first conferred by letters-patent. He added Valois and the *comtés* of Toulouse and Venaissin to the crown. Philippe IV. (1285—1314), surnamed *Le Bel*, acquired Navarre, Champagne, and Brie by marriage. With a view of securing support against the secular and ecclesiastical nobility, with whom he was constantly at war, Philippe gave prominence to the burgher element in the nation, and on 28th March 1302, he, for the first time, called together the *états généraux*, or general estates, at which the *tiers état*, or burgher class, appeared together with the nobles and clergy. These changes were, however, accompanied by arbitrary innovations in the fiscal and other departments of the government, which were effected with reckless haste and violence. With a view of securing to the crown the great fiefs, he abrogated the right of females to succeed to landed property. His tyrannical persecution of the Templars shewed the extent to which the regal power could be stretched; and under his successors, Louis X. (1314—1316), Philippe V. (1316—1321), and Charles IV. (*Le Bel*), (1321—1328), the last direct descendant of the Capetian line, the rule of the kings of F. became even more unlimited, whilst the court was given up to every species of luxurious indulgence known to the age. Philippe VI., the first of the House of Valois (1328—1350), a distant relative of Charles IV., and the nephew of Philippe IV., succeeded in right of the salic law. His reign, and those of his successors, Jean (1350—1364) and Charles V. (*Le Sage*), (1364—1380), were disturbed by constant wars with Edward III. of England, who laid claim to the throne in right of his mother, a daughter of Philippe le Bel. The war began in 1339; in 1346, the battle of Crécy was fought; at the battle of Poitiers (1356), Jean was made captive; and before its final close after the death of Edward (1377), the state was reduced to bankruptcy, the nobility excited to rebellion, and the mass of the people sunk in barbarism. Falsification of the coinage, onerous taxation, and arbitrary conscriptions, brought the country to the verge of irretrievable ruin, while the victories of England humbled the sovereign, annihilated the French armies, and cut down the flower of the nation. The long and weak minority of Richard II. diverted the English from the prosecution of their groundless claims to the kingdom of F., which revived somewhat from the effect of its long and disastrous warfare; but during the regency for the minor, Charles VI. (*Le Bien Aimé*), (1380—1422), the war was renewed with increased vigour on the part of the English nation, who were stimulated by the daring valour of Henry V. The signal victory won by the English at Azincourt in 1415; the treason and rebellion of the French princes of the blood, who governed the larger provinces; the ambition of the several regents, the ultimate imbecility of the king, the profligacy of his queen, and the love of pleasure early evinced by the dauphin, all combined to aid Henry in his attempts upon the throne, and at one period his recognition as heir to the crown, and the disorganised state of the nation, seemed to threaten the complete ruin of F.; but the premature death of Henry, the persevering spirit of the people, and the extraordinary influence exercised over her countrymen by the Maid of Orleans, Jeanne d'Arc, who instilled courage into the hearts of the soldiers, and roused the dauphin from his lethargic indolence, combined to bring about a thorough reaction, and, after a period of murder, rapine, and anarchy, Charles VII. (*Le Victorieux*), (1422—1461) was crowned at Rheims. He obtained from the Estates General a regular tax (*taille*) for the maintenance of paid soldiers, to keep in check the mercenaries and marauders who pillaged the country. The policy of his successor, Louis XI. (1461—1483), the first king entitled 'His most Christian Majesty,' favoured the burgher and trading classes at the expense of the nobles, while he humbled the power of the crown-princes. He was a crafty ruler, who managed the finances well, and succeeded, by policy and good-luck, in recovering for the crown the territories of Maine, Anjou, and Provence; while he made himself master of some portions of the territories of Charles the Bold, Duke of Burgundy. Charles VIII. (1483—1498), by his marriage with Anne of Brittany, secured that powerful state, and consolidated the increasing power of the crown. With him ended the direct male succession of the House of Valois. Louis XII. (1498—1515), (*Le Père du Peuple*) was the only representative of the *Valois-Orleans* family. The tendency of his reign was to confirm the regal supremacy, while the general condition of the people was ameliorated. He and his successor, Francis I. (1515—1547), of the *Valois-Angoulême* branch, wasted their resources in futile attempts to establish their hereditary claims to Lombardy, and were thus perpetually embroiled with the House of Austria. A *concordat* with the pope, signed in 1516, secured the nomination of the Gallican bishops to the king. In this reign, the Assembly of Notables and Deputies superseded the General Estates. The defeat of Francis at the battle of Pavia, in 1525, and his subsequent imprisonment at Madrid, threw the affairs of the nation into the greatest disorder, and embarrassed the public finances to a most ruinous extent. Arts and literature were encouraged in this reign, and in that of the succeeding monarch, Henri II. (1547—1559), who continued the disastrous Italian war. In the latter reign began the persecutions of the Protestants, which were carried on with still greater cruelty under Henri's three sons, Francis II. (1559—1560), Charles IX. (1560—1574), and Henri III. (1574—1589), the last of this branch of the *Valois*. The massacre of St Bartholomew (1572) was perpetrated under the direction of the queen-mother, Catharine de' Medici, and the confederation of the League, at the head of which were the Guises. The wars of the League, which were carried on by the latter against the Bourbon branches of the princes of the blood-royal, involved the whole nation in their vortex. The succession of Henri IV. of Navarre (1589—1610), a Bourbon prince, descended from a younger son of St Louis, allayed the fury of these religious wars, but his recantation of Protestantism in favour of Catholicism, disappointed his own party. The early part of his reign was perpetually disturbed by the mutinies of the troops and the rebellions of the nobles. By degrees, however, Henri, through the astute counsels of his minister Sully, and by his own personal popularity, raised the power of the crown higher than ever, while he began a system of thorough administrative reform, which was only arrested by his assassination by the fanatic Ravaillac. During the minority of his son, Louis XIII. (1610—1643), Cardinal Richelieu, under the nominal regency of Marie de' Medici, the queen-mother, ruled F. with a firm hand, although his oppression of the Protestants at home, and his co-operation with them abroad, in endeavouring to humble the House of Austria, entailed long and costly wars with little fame on France. Cardinal Mazarine, under the regency of the queen-mother Anne of Austria, exerted nearly equal power for some time during the minority of Louis XIV. (1643—1715). The wars of the Fronde, the misconduct of the parliament, and the humbling of the nobility, gave rise to another civil war, but with the assumption of power by young Louis, a new era commenced, and till near the close of his long reign, the military successes of the French were most brilliant, and the boundaries of F. were enlarged by conquests and treaties very nearly to what they are now. The military glory of the kingdom was maintained by a host of gallant commanders, amongst whom stood conspicuous the names of Turenne, Vauban, Luxembourg, Catinat, Vendôme, Boufflers, and Créqui, while, by the far-sighted policy of the minister Louvois, a well-organised army and a newly-created navy made the power of F. formidable to all neighbouring nations. The progress of the people in the arts of peace was not less marked. At the close of his rule, the oppressive war-taxes, the prodigality of the court, the luxurious lives of the clergy, and the absolutism and bigotry of the aged monarch, combined to undermine the foundations of national prosperity and freedom, and at his death the state was left trammelled with a debt of 3500 millions of livres, and his youthful heir, Louis XV. (1715—1775), succeeded to a heritage whose glory was tarnished, and whose stability was shaken to its very foundations. The long inglorious reign of Louis XV. presents nothing worthy of notice except the gradual rise of those sentiments of infidelity and licence which prepared the overthrow of all the ancient institutions of the country. The regency of the profligate Orleans paved the way for the miseries which followed, while his corrupt financial administration brought the nation into the most overwhelming monetary embarrassments. In this reign, Corsica was added to France. The thorough disorganisation of the state, and the neglect of the fleet and army, prevented all attempts at conquests either on sea or land. The colonies were left a prey to the attacks of other powers, while the capricious change of policy which the king's mistress, Madame Pompadour, forced upon the government, brought contempt upon the country. The peace of Paris, 1763, by which the greater portion of the colonial possessions of F. were given up to England, terminated an inglorious war, in which the French had expended 1350 millions of francs. The close of this unhappy reign was still further disturbed by the cabals of the Jesuits, who were finally banished in 1764. In 1774, Louis XVI., a well-meaning, weak prince, succeeded to the throne. His first ministers, Maurepas, Turgot, and Malesherbes, had not the vigour to carry out the reforms which their sense and patriotism suggested to them, and they were soon compelled to yield to the intrigues of the nobility, and resign their places. They were succeeded by the financier Necker, who endeavoured, by economy and method, to arrest the impending bankruptcy of the state, and succeeding ministers made futile attempts to diminish these financial disorders by new forms of taxation, which were generally opposed either by the assembly or the court. The American war of freedom had disseminated republican ideas among the lower orders, while the Assembly of the Notables had discussed and made known to all classes the incapacity of the government, and the wanton prodigality of the court. The nobles and the *tiers état* were alike clamorous for a meeting of the states; the former wishing to impose new taxes on the nation, and the latter determined to inaugurate a thorough and systematic reform. After much opposition on the part of the king and court, the *états généraux*, which had not met since 1614, assembled at Versailles on the 25th of May 1789.

F. was at that moment ripe for a revolution. Although the nobility was exceedingly numerous (as not only did the children of a noble belong to this class, but its numbers were constantly being increased by creation), there were great differences in the rank and dignity attached to the order; thus, in 1789, there were only 44 secular peers, independently of the princes of the blood, and the six originally created ecclesiastic peers; but the lower grades of nobility were so numerous that their numbers stood in the ratio of 1 to 250 of the entire population. Nevertheless, every grade of nobility exempted its holder from the payment of the ordinary land-tax, or *taille*, from the charge of maintaining the public roads (*corvée*), from military conscription, from receiving billets of soldiers, &c. The nobles paid the *capitation* tax, but in a very unequal proportion, although the landed property was vested almost entirely in their hands. They, in fact, monopolised (together with the clergy) the principal share of the national revenues, and left to the lower classes the burden of labour and of paying the taxes. At the outbreak of the Revolution, the French nobility were sunk in profligacy, and fallen to the lowest stage of demoralisation. The clergy kept pace with the nobles in general depravity, and while their aggregate revenues amounted, according to Necker, to 130,000,000 of livres, and their landed property stood in the relation of 1 to 5¾ of that of all other proprietors, their contributions towards the maintenance of the state were inadequate and irregular; the open profligacy and wasteful excesses of many of the higher members of the hierarchy, brought the whole order into disrepute. Francis I. had wrung from the church a tithe, known as the *décime paschaline*, and every five years the clergy were expected to present their so-called *dons gratuits ordinaires*, of from 15 to 18 million of livres; while on occasions of need they from time to time made extraordinary *dons gratuits*, which, however, were usually repaid at long intervals. The *tiers état* were crushed by the weight of an unjust taxation, which was rendered more obnoxious by the system of farming out some of the taxes. The most tyrannical of these was the tax on salt. The municipal institutions which had been permitted to flourish under some of the Valois princes in the middle ages, were almost entirely abolished, and the offices of towns, like those of the state and the courts of justice, were either hereditary or open to purchase; the *tiers état*, which included professional men, and all who were not either members of the noble or the clerical orders, saw themselves utterly excluded from all participation in the privileges and duties of free citizens, at the very time when the extensive circulation of the writings of the philosophers of the 18th c., as Voltaire, Malesherbes, Rousseau, and Montesquieu, had habituated men's minds to the discussion of questions of political independence, equal rights, and universal freedom.

The resistance made by Louis and his advisers to the reasonable demands of the Deputies on the 17th June 1789, led to the constitution of the National Assembly—a measure which was followed, on the 23d of June, by a declaration of the inviolability of the members. The king retaliated by ordering a large body of troops under arms, dissolved his ministry, and banished Necker, whom he had shortly before recalled under the pressure of public opinion. The consequence was the outbreak of insurrectionary movements at Paris, where blood was shed on the 12th July. On the following day, the national guard was convoked; and on the 14th, the people took possession of the Bastille. The provinces repeated the acts of Paris, and everywhere national guards and revolutionary municipal councils were called together. On the 4th of August, feudal and manorial rights were abrogated by the National Assembly, which gave expression to a solemn declaration of the equality of human rights. The royal princes and all the nobles who could escape sought safety in flight. The royal family having attempted in vain to follow their example, tried to conciliate the people by the feigned assumption of republican sentiments; but on the 5th October, the rabble, followed by numbers of the national guard, attacked Versailles, and compelled the king and his family to remove to Paris, whither the Assembly also moved. The next two years witnessed the solemn inauguration and the subsequent retraction of various constitutional schemes; the princes of the blood and the ancient noblesse raised corps of emigrés in different parts of the country, but their efforts could not arrest the spread of republicanism. The king alternately made concessions to the republicans, and cherished schemes for escaping from their surveillance, but each month added to his humiliations and to the audacity of those surrounding him. A war with Austria was begun in April 1792; and the defeat of the French was visited on Louis, who was confined in August with his family in the Temple. The advance of the Prussians into Champagne threw Paris into the wildest excitement. The National Assembly dissolved itself in September. In December, the king was brought to trial, and called upon to answer for repeated acts of treason against the republic. On the 20th January 1793, sentence of death was passed upon him; and on the following day he was beheaded. Revolts burst out in every part of France. England, Holland, Spain, Naples, and the German States combined together against the republic. Christianity was now formally deposed, and the sacredness of the republic and the worship of Reason solemnised. Marie Antoinette, the widowed queen, was guillotined; the dauphin and his surviving relatives suffered every indignity that malignity could devise. A reign of blood and terror succeeded. Danton and Robespierre, after having condemned countless numbers to the guillotine, suffered each in turn a similar fate. After the destruction of the Terrorists, a reaction was gradually established; the people were wearied of bloodshed, and anxious for peace and order at any cost. The brilliant exploits of the young general, Napoleon Bonaparte, in Italy, turned men's thoughts to other channels. In 1795, a general amnesty was declared, peace was concluded with Prussia and Spain, and the war was carried on with redoubled vigour against Austria. The Revolution had reached a turning-point. A Directory was formed to administer the government, which was now conducted in a spirit of order and conciliation. In 1797, Bonaparte and his brother-commanders were omnipotent in Italy. Austria was compelled to give up Belgium, accede to peace on any terms, and recognise the Cisalpine Republic. The glory of the French arms was re-established abroad, but at home the nation were still suffering from the shock of the Revolution. The Directory repudiated two-thirds of the national debt, and thus almost ruined the commerce and credit of France. Under the pretext of attacking England, a fleet of 400 ships and an army of 36,000 picked men were equipped; their destination proved, however, to be Egypt, whither the Directory sent Bonaparte; but the young general, resigning the command to Kleber, landed in F. in 1799, and at once succeeded in supplanting the Directory, and securing his own nomination as Consul, conjointly with Sièyes and Roger Ducos. In 1800, a new constitution was promulgated, which, although in appearance purely constitutional, in reality vested the sole executive power in Bonaparte, who shewed consummate skill in re-organising the government, to which he imparted a systematic efficiency and a spirit of centralisation, that secured a thoroughly practical administration. Having resumed his military duties, he marched an army over the Alps, attacked the Austrians unawares, and decided the fate of Italy by his victory at Marengo. In 1801, the peace of Lunéville was concluded, and the boundaries of F. were extended to the Rhine. England was the only country which refused to recognise the legality of the various Italian and German conquests of F.; and with the exception of a brief period of peace, this country remained the implacable foe of Bonaparte from the days of the Consulate to his defeat at Waterloo. Every period of respite from war was employed by the First Consul in reinstating trade and industry, and in obliterating both in private and public life the stains left by the Reign of Terror. In 1804, on an appeal by universal suffrage to the nation, Bonaparte was proclaimed emperor. The pope came to Paris to crown him and his wife Josephine; a new nobility was rapidly created, and the relatives and favourites of the emperor received vanquished kingdoms and principalities at his hands. For a time, Napoleon's influence with the weakened powers of the continent succeeded in maintaining an injurious system of blockade against England; and, except in the Peninsula, his arms were everywhere victorious. By his marriage with the Archduchess Maria Louisa, daughter of the Emperor of Germany, Napoleon seemed to have given to his throne the prestige of birth, which alone it had lacked. He now availed himself of the freedom afforded by the peace with Austria to expand the material prosperity of the country, by encouraging trade, constructing roads, bridges, and canals in every part of the empire, and by consolidating his government, and organising a complete code of laws and a systematic mode of administering them; but this period was the poorest in respect to the literary and scientific development of the nation, who were too much trammelled by police supervision and military discipline to exercise freedom of thought and intellect. This interval of comparative repose was soon interrupted by the ambitious designs of Napoleon on Germany, which led to a declaration of war against Russia in 1812. From this time to his final defeat in 1815, the emperor rapidly receded from the lofty station he had won for himself. The disastrous Russian campaign, in which his noble army was lost amid the rigours of a northern winter, was soon followed by the falling away of his allies and feudatories. Napoleon himself was still victorious wherever he appeared in person, but his generals were beaten in numerous engagements; and the great defeat of Leipsic compelled the French to retreat beyond the Rhine. The Swedes brought reinforcements to swell the ranks of his enemies on the east frontier, while the English pressed on from the west; the senate and his ministry betrayed his cause, and the allies threw themselves on Paris, which, in the absence of the emperor, capitulated after a short resistance, March 30, 1814. Napoleon now abdicated in favour of his young son, and retired to the island of Elba, the sovereignty of which had been granted to him. His wife and son removed to Vienna; his family were declared to have forfeited the throne; F. was reduced to her former limits, and the provinces she had acquired were restored to their national rulers. On the 3d May, Louis XVIII. (the brother of Louis XVI.) made his entry into Paris. The conduct of the Bourbons did not conciliate the nation; they returned loaded with debts, and surrounded by the old nobility and clergy, who had not renounced their former privileges, and who looked upon the generation of Frenchmen who had arisen during their absence as their natural enemies. A narrow spirit influenced the weak policy of the king, which led to the establishment of a strict censorship, the extension of the powers of the police, and the persecution of all the adherents of the Empire; while the lower classes and the army, who were alike sensible of the humiliating reaction which had followed the former excitement of war and conquest, were treated with an indifference, and even contempt, by the returned emigrés, to which they were wholly unaccustomed. On the 1st March 1815, Napoleon left Elba, and landed in France. Crowds followed him; the soldiers flocked around his standard; the Bourbons fled, and he took possession of their lately deserted palaces. The news of his landing spread terror through Europe; and on the 25th March, a treaty of alliance was signed at Vienna between Austria, Russia, Prussia, and England, and preparations at once made to put down the movement in his favour, and restore the Bourbon dynasty. At first, the old *prestige* of success seemed to attend Napoleon; but on the 18th June, he was thoroughly defeated at Waterloo; and having placed himself under the safeguard of the English, he was sent to the island of St Helena, in conformity with the generally acknowledged sentiment, that it was necessary to the peace of Europe to remove him finally and definitely from the scene of his former power. The second restoration gave occasion to many pledges of a more liberal policy on the part of Louis, but few of them were fulfilled, and a general and sullen discontent reigned among the people, who were again deprived of all voice in the administration, or in the election to offices, and were harassed by the petty tyranny of the priests, who were the favourite advisers of the crown. In 1821, Napoleon breathed his last at St Helena; and in 1824, Louis XVIII. died without direct heirs, and his brother, the Duc d'Artois, succeeded as Charles X. The same ministerial incapacity, want of good faith, general discontent, and excessive priestly influence characterised this reign, which was abruptly brought to a close by the revolution of 1830, and the election to the throne of Louis Philippe, Duke of Orleans, as king, by the will of the people. Legitimist insurrections disturbed the nation; one *émeute* succeeded another; attempts upon the king's life were frequent; but the progress in material prosperity made the government popular with the *bourgeoisie*, or middle classes, and for a time it held its ground. The policy of the king was to amuse the populace, and flatter the national vanity, which was gratified by the Algerine war, successfully terminated by the costly acquisition of Algeria in 1835; but the throne of 1830 could not stand against any unexpected shock; and the dissatisfaction arising from the scarcity of the harvests and the high prices of 1847, were soon followed by open demonstrations of insurrection; and in 1848, the hostile bearing of the national guards, when called upon to defend the king against the *émeute* in Paris, left him, as he thought, no alternative but to abdicate. Much blood was shed at Paris in an attack on the barricades, when the archbishop and many other persons of distinction were slain; and in the following December, Prince Louis Napoleon Bonaparte (the nephew of the Emperor, and son of his brother Louis, king of Holland) was proclaimed president of the republic. By a *coup d'état*, the president prevented the national revolution, which general rumour had led people to expect in 1852; and having dissolved the Assembly, assumed dictatorial powers, and appealed to the people to sanction his act by their votes. The army had already been won over by him; and on his nomination by universal suffrage to the presidency for ten years, he promulgated a new constitution, very similar to the one framed by Napoleon I. in 1799. This measure was followed in December 1852 by a motion of the senate for the re-establishment of the Empire. Another appeal to the nation was accordingly made under the same apparently coercive pressure as on the former occasion, and with a similar result; and since December 2, 1852, Prince Louis Napoleon has exercised the most absolute power over F., under the title of the Emperor Napoleon III. For a detailed account of the principal events in the history of F., see *Historiæ Francorum ab anno* 900—1285; Petitot's *Collection du* XIII.—XV. *Siècle;* Froissart's *Chroniques de France* from 1326—1400; Michelet (complete to Louis XIV.); Anquetil (1805); Sismondi, *Histoire de France* (1832—1843); Thierry (1827); Guizot, *Essais sur l'Histoire de France* (1834); Lacretelle, *Sur l'Histoire de France pendant le* 18 *c.* (1819);

Thiers, *Histoire de la Révolution*, and *De l'Empire* (1823—1827); Crowe, *History of France*, 5 vols. (1858); *Statistique gén. de la France* (Schnitzler, 1842—1846), &c.

FRANCE, Isle of. See Mauritius.

FRANCE'SCO DI PAULA, founder of the order of the *Minims*, was born in 1416 at Paula or Paolo, a village of Calabria. From birth, his destination was the church, for which he was happily fitted by nature and preference. At the age of 12, he was the inmate of a Franciscan convent, practising with the utmost rigour the regulations of the order; and at 14, renouncing all worldly possessions, he retired to a cave, where he inflicted on himself every species of self-mortification, and devoted his time to prayer and meditation. The fame of his piety having attracted to his cell several emulators of his austere life, he received permission from the bishop to erect a church and convent, and the new community received from Pope Sixtus IV. the title of the Hermits of St Francis. To the usual conventual vows, F. added one of the most rigorous abstinence—flesh, eggs, and milk being strictly forbidden the entire year, except in illness. Popular report having attributed to F. several wonderful cures, Louis XI. of France, the most superstitious of monarchs, being severely ill, summoned him to his presence, in hopes of some miraculous display of power on his behalf. F. repaired to France, where he was received with the highest honour, and attended the king on his death-bed. The successors of Louis, Charles VIII. and Louis XII., treated F. with great favour, consulted him in important matters, and induced him to settle in France. Charles VIII. built him a convent at Plessis-le-Tour, and another at Amboise. F. died at the former in 1507, and was canonised in 1519.

FRANCHE COMTÉ, an old province in the east of France, in the basin of the Rhone, comprised what now forms the departments of Doubs, Haute-Saône, and Jura, and had for its capital Besançon.

FRA'NCHISE. In its political acceptation, the franchise may be said to be the right which centres in the individual holding it to exercise a certain limited portion of the general sovereignty of the state. A franchise in this sense is possible only in a free state, i. e., in a state in which the governed, as a whole, are identical with the governors. It does not necessarily involve the idea of representative government; for where legislation is effected by the votes of the people themselves, as it was in the small states of antiquity, the franchise is exercised by each individual directly, without the intervention of any representative machinery. Where representation has been introduced, the franchise is the right which the citizen has of voting for his representative, not the right of voting in the legislative body conferred on the representative in consequence of being sent thither, and is an expression not of the sovereignty which centres in him, but of that which belongs to the constituents who send him. There would be no theoretical inconsistency, however, in applying the term franchise to the right of voting in the House of Lords, which belongs to each peer, because he here exercises the sovereignty, or original freedom which belongs, or is supposed to belong, to himself, and does not represent that of others. As the franchise is the political expression of the sovereignty which centres in each free citizen, the extent or value which ought to belong to the franchise will be measured by the amount of the sovereignty which it expresses. But this sovereignty again corresponds, or finds forms of actual expression, in the social position which the individual occupies, in the amount of power and influence which is conceded to him by the society of which he is a part. A theoretically just franchise, then, would be one which corresponded accurately to the social position of each individual, which translated the verdict by which society fixed his status into the language of politics. But scientific accuracy in such matters, for obvious reasons, is unattainable. An approximation in the individual case is all that is possible in dealing with the mass, and one of the questions which is at present most keenly discussed amongst speculative politicians is, by what test shall this approximate estimate of social value be brought most nearly to the truth. Mr J. S. Mill has proposed intelligence, as indicated by instruction, as the sole measure of individual sovereignty, and, consequently, as the basis of the franchise (see his recent work on Representative Government). Others have proposed wealth; whilst by a third class of speculators it is contended that, in the case of each individual, there are various elements of social importance which must be taken into account in determining the political value which is his due. By all the more recent writers on the theory of government, however, the idea of all citizens being entitled to an equal suffrage, however great might be the disparity of intelligence, wealth, manhood, and other elements which go to make up social importance, is repudiated as a scientific absurdity, and reprobated as the source of all the practical injustice which results from what are commonly known as democratic governments. See Mill's work, alluded to above; also Parliamentary Election.

FRANCHISE in England is a royal privilege, or branch of the crown's prerogative, subsisting in the hands of the subject. Being derived from the crown, franchises must arise from royal grant, or in some cases may be held by prescription, which presupposes a grant (Stephen's *Com.* i. 637). The subjects of franchise being the peculiar property of the crown, correspond with what in Scotland are called Regalia (q. v.); and a franchise is analogous to a grant of regalia. Gifts of waifs, estrays, wrecks, treasure-trove, royal fish, and forfeitures, all of which are the prerogative of the crown, are franchises. The rights of forest, chase, park, warren, and fishery are also franchises, no subject being entitled so to apply his property for his own convenience. A county palatine (see Palatine) is the highest species of franchise, as within it the earl, constable, or other chief officer, may exercise without control the highest functions of the sovereign. And as the crown may thus erect an entire county into an independent jurisdiction, so it may create a liberty or bailiwick independent of the sheriff of the county. This, then, is another species of franchise. It is likewise a franchise for a number of persons to be incorporated, and subsist as a body-politic, with a power to maintain perpetual succession, and do other corporate acts; and each individual member of such corporation is also said to have a franchise or freedom. The right to hold a fair or market, or to establish a ferry, and to levy tolls therein, is also a franchise. Where the holder of a franchise is disturbed in his right, he may sue for damages by an action on the case; or in the case of non-payment of tolls, he has the remedy of Distress (q. v.). Franchises may be extinguished by reunion with the crown, or may be lost by *misuser*—that is, such a use of them as is contrary to the express or implied condition on which the royal grant proceeded—or by *non-user*.

FRANCIA, Dr José Gaspar Rodriguez, Dictator of Paraguay, was the son of a small landed proprietor, of French or Portuguese origin, and was born near the town of Asuncion in 1757 or 1758. He was intended for the church, studied at the university of Cordova de Tucuman, where he took his degree as a doctor of divinity or of canon law, and was for some time a theological professor. Subsequently he adopted the profession of law, to the practice of which he continued to devote himself for a period of thirty years, gaining much reputation for learning, skill, honesty, and independence of character. When he had attained the age of fifty-two or fifty-three, the revolution which shattered the Spanish yoke in South America broke out in Buenos Ayres. Paraguay at first offered active opposition to the revolutionists, but ultimately sought to obtain independence for itself. F. took a leading part in the movement, and was made secretary of the independent junta set up, but he soon resigned his post. The conviction, however, being strong in the public mind that F. alone could properly direct the affairs of the new republic, he was, in 1813, appointed joint-consul along with General Yegros. The latter, however, was a man apparently without much intellect or energy, and F. was really sole ruler from the first. In 1814, he was appointed dictator for three years, at the expiry of which time the dictatorship was given him for life; and the absolute control so conferred he exercised until his death in 1840. Under F., the condition of Paraguay rapidly improved, and the system of non-intercourse, political or commercial, with other nations, which he enforced, however much it may seem to prove him devoid of administrative sagacity, was undoubtedly attended with good results to his country. So strict were the regulations against foreign intercourse, that ingress to, or egress from, Paraguay was next to impossible; and F.'s treatment of some foreigners who did get in (among others the famous savant Bonpland), and of others who were prevented entering, savoured of harshness, and even barbarism. Yet his administrative talent was of a high order. He improved agriculture, making two crops of corn grow where only one had grown before. He introduced schools, promoted education, repressed superstition, and enforced strict justice between man and man in his law-courts. His death was regretted by the people as a public calamity—the best proof that he was no vulgar tyrant. See Rengger and Longchamp's *Essai Historique*, &c. (Paris, 1827); *Francia's Reign of Terror* (London, 1839), by J. P. and W. P. Robertson, two young Scotchmen whom F. turned out of the country; and T. Carlyle's essay in the *Edinburgh Review* (1843).

FRANCIS, OF ASSISI, founder of the Franciscan order, and a saint of the Roman Catholic Church, was one of the most extraordinary men of his age, and merits a detailed notice, as illustrating in his career all the most remarkable characteristics of the religious life of the middle age. He was born in 1182, of the family called Bernardini, at Assisi, where his father was engaged in trade. His baptismal name was John; but from his familiarity with the Romance, or language of the troubadours, in his youth, he acquired the name of *Il Francesco* ('The little Frenchman'). In his early years, he was remarkable for his love of gaiety and ostentatious prodigality; but even then his bounty to the poor was one of the largest sources of his wastefulness. He engaged eagerly in exercises of chivalry and of arms; and in one of the petty feuds of the time, he was taken prisoner, and detained for a year in captivity at Perugia. An illness which he there contracted turned his thoughts from earth; and although he again engaged in military pursuits, a second illness at Spoleto decided his career for life. He now resolved to fulfil literally the counsels of the gospel, and he especially devoted himself to poverty, which, in the mystic language thenceforth familiar to him, he designated as 'his bride.' Under an impulse which he received while listening to a sermon, he took a vow never to refuse alms to a beggar. He made a pilgrimage to the tomb of St Peter at Rome, and there offered to God all that he possessed on earth. On his return to Assisi, he exchanged his clothes with a poor mendicant; and disregarding all remonstrance and ridicule, he ever afterwards continued to wear the meanest attire. He gave to a priest who was rebuilding a ruined church the price of his horse, which he sold for the purpose, and even sought to appropriate to the same use the moneys of his father, which, however, the priest refused to accept. To avoid his father's anger, he took refuge in a cave, in which he spent a month in solitary prayer, and from which he returned more than ever confirmed in his enthusiasm. His father having in vain confined him in a dark room of his own house, cited him before the magistrates, and, on F.'s declining all civil jurisdiction in such a case, before the bishop, in order to compel him to renounce his inheritance. F. abandoned all, even to the very clothes he wore, and then declared that 'till now he had been the son of Bernardini, but that henceforth he had but one Father, Him that is in heaven.' Thenceforth, no humiliation was too low for F.; he begged at the gates of monasteries; he discharged the most menial offices; he served the lepers in the hospital at Gubbio in their most revolting necessities, and with the most tender assiduity. He worked with his own hands at the building of the church of St Damian, and at that of Sta Maria degli Angeli, which he afterwards called his 'Portiuncula,' or 'little inheritance;' and as the last act of self-spoliation, and the final acceptance of the gift of poverty, he threw aside his wallet, his staff, and his shoes, and arrayed himself in a single brown tunic, of coarse woollen cloth, girt with a hempen cord. This was in his 26th year, in 1208. His enthusiasm by degrees excited emulation. Two of his fellow-townsmen, Bernard Quintavalle and Peter Cattano, were his first associates. They were followed, although slowly, by others; and it was not till 1210, that, his brotherhood having now increased to eleven in number, he drew up for them a rule, selected in the true spirit of religious enthusiasm, by thrice opening at random the gospels upon the altar, and taking the passages thus indicated as the basis of the young institute. (Milman's *Latin Christianity*, iv. 264.) The new brethren repaired to Rome, where their rule was approved (though at first only *vivâ voce*) by Pope Innocent III. in 1210. The two following years were spent by the brotherhood in preaching and exhorting the people through the rural districts of their native and the adjoining provinces; and F. himself returned to Assisi in 1212, at which time he finally settled the simple constitution of his order, the church of Sta Maria degli Angeli being assigned to them as their home. In common with the older forms of monastic life, the Franciscan institute is founded on the three vows of chastity, poverty, and obedience; but of these the second was, in the eyes of F., the first in importance and in spiritual efficacy. In other orders, the practice of poverty consisted in the mere negation of riches. With F., it was an active and positive principle. In other orders, although the individuals could not possess, it was lawful for the community to hold, property in common. F. repudiated all idea of property, alike for his order and for its members; he even disclaimed for them the property in those things which they retained for personal use—the clothes which they wore, the cord with which they were girded, the very breviary from which they chanted the divine office. The very impossibility, to human seeming, of these vows, was their strength. Numbers crowded to the standard of Francis. He told them off in parties to different provinces of Italy. Five of the brotherhood repaired to Marocco to preach to the Moors, and, as the first martyrs of the order, fell victims to their holy daring. Success removed all the hesitation with which the institute at first was regarded, and in 1216, the order was solemnly approved by Pope Innocent. From this date it increased with extraordinary rapidity. At the first general assembly, held in 1219, 5000 members were present; 500 more were claimants for admission. F. himself inaugurated the future missionary character of his brotherhood by going (1223) to the East, and preaching the gospel in the presence of the sultan himself; but the only fruit of his mission was a promise from the sultan of more indulgent treatment for the Christian captives, and, for the Franciscan order, the privilege which they have since enjoyed, as guardians of the Church of the Holy Sepulchre. It is after his return to Italy that his biographers place the celebrated legend, which, to friends or to enemies, has so long been a subject of veneration or of ridicule—his receiving, while in an ecstasy of prayer, the marks (*stigmata*) upon his own person of the wounds of our Divine Redeemer. The scene of this event is laid on Monte Alverno, a place still sacred in the traditions of the order; and the date is September 17, 1224. Two years later, St F. died, October 4, 1226. On the approach of his last hour, he requested that he should be carried upon a bier to the church, where he had himself placed on the bare ground, thus realising in his own death the most literal extreme of the doctrine which he had made in life the basis of his system. He was canonised by Pope Gregory IX. in 1228.

The works of St F. (folio, Pedeponti, 1739) consist of letters, sermons, ascetic treatises, proverbs, moral apothegms, and hymns. The latter are among the earliest metrical specimens of the Italian language. They are exceedingly simple, and full of the tenderest expressions of the love of God. His prose is often more poetical than his poetry itself, abounding in allegory and poetical personification. Few writers have ever turned the love and admiration of external nature to a purpose so beautifully devotional. ‘Of all the saints,’ says Dean Milman, ‘St Francis was the most blameless and gentle.’ No saint, it may be added, has been the subject of more exaggerated panegyric from the writers of his order; and one of the works in his praise—a parallel between St F. and our Divine Redeemer—is disowned by the Roman Catholic community as a most reprehensible exaggeration, the fruit of an affectionate, but most misdirected zeal for the memory of the founder of the Franciscan order.

See the Bollandist, *Acta Sanctorum*, October 4; St Bonaventure’s Life of St Francis, with Wadding’s notes; Helyot, *Hist. des Ordres Religieux*, tom. vii.; Butler’s *Lives of Saints*, October 4; Milman’s *Latin Christianity*, vol. iv.; Gieséler’s *Church History*, vol. iii.; Döllinger’s *History of the Church; St Francis and the Franciscans* (Dublin, 1861).

FRANCIS, Sir Philip, son of the Rev. Dr Philip Francis, author of a well-known translation of Horace, was born at Dublin, October 22, 1740, and educated at St Paul’s School, London, where he had for a school-fellow Henry S. Woodfall, afterwards the printer of the *Public Advertiser*, and the publisher of the *Letters of Junius*. In 1756, he obtained a place in the office of Mr Fox, then secretary of state, which he retained under his successor Mr Pitt. In 1760, he became secretary to the Earl of Kinnoul, who had been appointed British ambassador to Portugal; and on his return to England in 1763, he received an appointment in the War-office. Ten years later, he was sent out to India, as a member of the council for the government of Bengal, with a salary of £10,000. Here he came into collision with the governor-general, Warren Hastings, and so far did the quarrel proceed, that a duel was the consequence, in which F. was severely wounded. In December 1780, he resigned his situation, and returning to England, entered parliament for the borough of Yarmouth, in the Isle of Wight, in 1784. He never obtained a reputation as an orator, but his great abilities and extensive information always commanded the respect and attention of the House. The prosecution of Hastings, begun in 1786, was hailed by him with malignant joy, and it must be confessed that he displayed a most ungenerous alacrity and activity in furthering the designs of the committee of impeachment. In his political opinions, F. was a decided and consistent Whig, at a time when Whiggism meant very much the same as the Radicalism of a later period. He exulted at the success of the French Revolution, was an active member of the association of ‘Friends of the People,’ and ably supported the efforts of Fox and Grey for a reform in the representation of the nation. He withdrew from parliament in 1807, and died December 22, 1818. F. wrote upwards of twenty political pamphlets. He has also been considered by many to have the best claim to the authorship of the *Letters of Junius* (q. v.).

FRANCIS I., king of France, son of Charles, Comte d’Angoulême, was born at Cognac, September 12, 1494, and in his youth manifested an ardent love for literature, especially for the romances of chivalry, whence, probably, he drew his brilliant but erroneous views of a kingly character. At the age of twenty, he married Claude, daughter of Louis XII., and succeeded his father-in-law, January 1, 1515. His first act, after mounting the throne, was to set about the reconquest of Milan, which had been wrested from his predecessor two years before; and at the head of 40,000 men, among whom were such great warriors as the Constable Bourbon, Bayard, Lautrec, and Trivulzio, F. crossed the Alps, and attacked the Swiss allies of the Milanese at Marignano, ten miles from Milan. Here a sanguinary battle, afterwards called the ‘battle of the giants,’ ensued (13th September 1515), in which F. obtained a complete victory—the Swiss losing 12,000 men. In accordance with his chivalrous propensities, F. accepted knighthood on the field from the renowned Bayard. After some further successes, F. returned to Paris in the month of February 1516. On the death of Maximilian, emperor of Germany, in January 1519, F. and Charles of Spain became rival candidates for the imperial crown. The election of the latter excited the anger of F., who immediately prepared for war, and endeavoured to secure the alliance of Henry VIII. of England. An interview took place in 1520 between the two monarchs on the famous *field of the cloth of gold*, between Guines and Ardres, but it led to no result, and shortly after, Henry formed an alliance with the pope and the emperor against Francis. The papal troops drove the French out of Italy; and the soldiers of Henry and the emperor invaded France on the north, while, to complete his perplexities, the Constable Bourbon, who was discovered to be conspiring against his sovereign, fled to Charles, who gladly accepted the sword of the renegade warrior. F. gallantly faced the dangers that now threatened his kingdom. A large army was sent to Italy under the command of Bonnivet, who, however, proved incapable, and was forced to retreat across the Alps. In the course of this retreat, Bayard lost his life. The imperialists now advanced into Provence, but, on the approach of the French king, withdrew into Italy, whither they were followed by F., who overran Lombardy, but was totally defeated and taken prisoner at the battle of Pavia, 24th February 1525. Charles carried his captive to Madrid, and only granted him his liberty on the hardest conditions. F. had to renounce the suzerainty of Flanders and Artois, the duchy of Burgundy, and all his Italian possessions and prerogatives, to promise the restoration of Bourbon to his former dignities, and to surrender his two sons as hostages. He obtained his freedom, March 17, 1526; but regarding the conduct of Charles as utterly base, his first act, on his return to his dominions, was a refusal to fulfil the pledges he had given. Pope Clement VII. absolved him from his oath; England, Rome, Venice, Florence, and Genoa—all of whom were growing alarmed at the immense power of Charles—withdrew from the imperial alliance, and sided with his antagonist. The war in Italy now recommenced. On the 5th May 1527, Bourbon's 'black banditti' stormed and sacked the 'Eternal City,' and captured the pope. F. now sent troops into Naples, which, after a series of brilliant successes, were almost wholly cut off by disease, mainly through the negligence of the king, who failed to supply them with the means of subsistence. About the same time, F. sent a challenge to Charles to decide their quarrel by single combat. The challenge was accepted, but the duel never came off. At last, a peace was concluded at Cambray, in July 1529, much to the advantage of the Spaniards. In 1534, however, war broke out between F. and the Duke of Milan; and in the following year the former overran Savoy, to which he laid claim by the absurdest pretensions. The conduct of Charles at this period was marked by the greatest moderation, but he was ultimately reinvolved in hostilities with his inveterate opponent. Little definite result ensued, but the war was marked by a circumstance regarded as horrible in those days—viz., an alliance between Christians and Turks. F. formally entered into a league with the Sultan Soliman, who went so far as to land troops in the south of Italy, but the French king shrunk from a practical co-operation with the arch-enemy of Christendom. By the efforts of Pope Paul III., a treaty was concluded for ten years at Nice between Charles and F., 18th June 1538. In point of fact, however, peace lasted only four years, and in 1542, F., insatiable of glory, launched five different armies against the emperor. The battle of Cerisolles, 14th April 1544, in which the French were completely victorious, partially wiped out the dishonour of the defeat at Pavia, but a second alliance of F. with the Turks renewed the indignation of Christendom. Charles, and Henry king of England, marched upon Paris, and F. was compelled to make peace at Crepy, 18th September 1544. His political rôle was now finished. He died at Rambouillet, March 31, 1547. It is not difficult to estimate the character of this monarch. Gay and voluptuous (it was the physical consequences of an amour which cost him his life), he was still capable of heroic impulses and acts of splendid generosity. But no amount of 'chivalry' could compensate for the lack of political sagacity; it could not even save him from deeds of cruelty. His persecution of the Vaudois and other 'heretics' has left a dark stain on his memory, which all his patronage of arts and letters will not efface. F. was himself a writer of verses; but these were so bad, that even French critics pronounce them almost intolerable.

FRANCIS I. (Stephen), Emperor of Germany, born in 1708, was the eldest son of Leopold, Duke of Lorraine. On the death of his father, in 1729, F. succeeded him in the dukedom, which, in 1735, he ceded to Stanislaus Leszczynski, father-in-law of Louis XV., to revert after his death to the crown of France. In lieu of Lorraine, he obtained the grand duchy of Tuscany, whose native rulers, the Medicean family, were about to die out. In 1736, he married Maria Theresa of Austria, the only daughter and heiress of the Emperor Charles VI. In 1740, Charles died, and Maria Theresa succeeded him; she made her husband co-regent with herself, but gave him little share in the administration. F. fought bravely for his wife's rights in the wars carried on against Frederick the Great. In 1745, he was elected to the once important dignity of Emperor of Germany, and crowned at Frankfurt. The famous Seven Years' War (1756—1763) now broke out between Austria and Prussia; but the cares which it imposed fell mainly upon his leonine consort, Maria Theresa. F. died at Innsprück, 18th August 1765. His son Joseph succeeded him in the imperial dignity, but Maria Theresa retained in her hands the sovereignty of the Austrian dominions till her death.

FRANCIS II., Emperor of Germany, and I. of Austria, the eldest son of Leopold II. Grand Duke of Tuscany, and of Maria Louisa, daughter of Charles III., king of Spain, was born at Florence, in February 1768. In 1790, his father became Emperor of Austria by the death of his brother Joseph, but died only two years after, when the crown devolved upon Francis. The French Revolution was now exciting the alarm of the old European dynasties; F. concluded an alliance with Prussia against the new republic; and the armies of the allies marched to the frontiers of France, but soon recoiled before the fiery enthusiasm of the republican troops. In 1794, F. placed himself at the head of the army of the Netherlands, which, on the 26th of April, defeated the French at Cateau and Landrecy; and on the 22d of May, gained the bloody battle of Tournay; but on the whole the fortune of the war was against him; and the triumphs of young General Bonaparte in Italy forced him to conclude the treaty of Campo Formio (October 17, 1797). Only two years afterwards, however, F., in alliance with Russia and England, again took up arms, and was at first successful; but the recall of the brave Russian general, Suwaroff, and the return of Bonaparte from the East, quickly altered the state of matters. The great victories won by Moreau at Hohenlinden, and by Bonaparte at Marengo, paralysed the powers of Austria, and F. was compelled to sue for peace, which was obtained by the treaty of Lunéville in 1801, by which the whole of the left bank of the Rhine was ceded to France. In 1805, the aggressions of France once more excited the jealousy of Austria. F. entered into a new alliance with Russia; and the contest was renewed, but ended more disastrously than ever for the Austrians. The French victories of Ulm and Austerlitz, and the capture of Vienna, completely humiliated F., who, at the peace of Presburg (December 1805), was obliged to surrender the Venetian states and the Tyrol. The German empire was now dissolved, after lasting for 1000 years, and F. assumed the title of Emperor of Austria, King of Bohemia and Hungary. In 1809, he recommenced the war with Napoleon, and obtained more success, or perhaps we should say, encountered less loss than on previous occasions. The tremendous battle of Aspern *was* a victory, though not a decisive one, and did much to restore the prestige of the Austrian arms. Still Napoleon again got possession of Vienna, and dictated terms of peace from the palace of Schönbrunn in October of the same year. In 1810 the French emperor married F.'s daughter, Maria Louisa. A permanent friendly alliance now seemed to be concluded between the two empires; and during the Russian campaign in 1812, the Austrians rendered the French some slight assistance. In 1813, Austria resumed its neutrality; but, after having exerted himself fruitlessly to mediate between France and Russia, F. suddenly joined the allies, helped to win the battle of Leipsic, and followed the Russians and Prussians to Paris in 1814. His subsequent career does not present any points of special importance. He laboured honestly and indefatigably for the welfare of his subjects, encouraging the making of roads and canals, and the introduction of manufactures; but his horror of everything revolutionary, excited by his early recollections, and by the cruel death of his aunt, Marie Antoinette, and kept alive by his long wars with France, had rendered him an absolutist in politics, and a lover of that system of centralisation to which Austria continues to cling. F. died on the 2d of March 1835.

FRANCIS JOSEPH, the present Emperor of Austria, born 18th August 1830, is the eldest son of the Archduke Francis (son of the Emperor Francis I.), and Sophia, a princess of Bavaria. F. was taught to speak all the various languages of his heterogeneous dominions, and only the year before the Hungarian revolution addressed the Magyar nobles at Pesth in their own language—a circumstance which secured him a certain transient popularity. In 1848, he served under Radetzky in the Italian wars. The Emperor Ferdinand having, in the hour of his extremity, made certain constitutional promises to the nation, the archduchess, F.'s mother, who during the whole year had directed the schemes of the anti-revolutionary party, resolved that the fulfilment of these promises should be evaded by a change of sovereign. Ferdinand accordingly abdicated in favour of his nephew (2d December 1848), and F. assumed the government as Emperor of Austria, and King of Hungary and Bohemia. Hungary, however, which had lost all faith in the House of Hapsburg, rose in arms, and refused to accede to the change of succession; and Italy again tried the fortune of war. The progress of the struggle between F. and the constitutionalists of Hungary is described in the biographies of Kossuth, Bem, Dembinski, Batthyani, &c. Suffice it to say that Austria triumphed in Italy, and also in Hungary, through the treachery of Görgei and the help of Russia. F. now devoted himself, with characteristic persistency, to the re-establishment of 'order,' that is to say, of despotism. He dissolved the national guard, and took away the freedom of the press, and on January 1, 1852, abolished the constitution of his uncle, which had been a dead-letter from the beginning. In 1853 he nearly lost his life by assassination, and in the Crimean War forfeited the respect of all the belligerents by his indecisive attitude. The *concordat* of 1855, by which certain extraordinary privileges were conferred on the bishops of the Roman Catholic Church, was another step backwards, which very properly excited the apprehension of the liberal party in Europe. Meanwhile the dissatisfaction of Lombardy, Venice, Hungary, and Galicia, hourly increased. Sardinia (backed by France) encouraged the national feeling in Italy, and at last, in 1859, F. hurried thoughtlessly into a war with that kingdom, which ended in the peace of Villa Franca and the cession of Lombardy to Sardinia. F. is now engaged in a doubtful struggle with the disaffection of his Hungarian subjects. See AUSTRIA, HUNGARY.

FRANCI'SCANS, ORDER OF, also called MINORITES or LESSER BRETHREN, a religious order of the Roman Catholic Church, founded by St Francis of Assisi. For an account of the establishment of the Franciscan order, and its earliest fortunes, see FRANCIS OF ASSISI. The subsequent progress of the order was equally wonderful. In less than half a century it reckoned no fewer than 33 'provinces,' the aggregate number of convents in which exceeded 8000, while the members fell little, if at all, short of 200,000. Some idea, indeed, of the extraordinary extension of this remarkable institute may be formed from the startling fact, that, in the dreadful plague of the Black Death in the following century, no fewer than 124,000 Franciscans fell victims to their zeal for the care of the sick, and for the spiritual ministration to the dying! But this marvellous external progress was accompanied by serious internal controversies and divisions. In the original scheme of the institute, its great fundamental characteristic was poverty, which St Francis proposed to render in his order not only more perfect theoretically, but more systematical in its practice, than it existed in any of the contemporary institutes. For the accomplishment of this design, the rule which he drew up contained a few brief and simple, but, understood literally, very effectual provisions; but the difficulty of their literal observance led, even in the lifetime of St Francis, to an attempt in the general assembly of the order to introduce some important modifications; and, though the authority of the founder was sufficient to prevent the adoption of these modifications during his lifetime, and although his last will contained a special clause prohibiting not merely all change of the rule, but even all interpretation of it, the attempt was renewed with still more determination under Brother Elias, his successor in the office of general of the order. The great subject of controversy was the nature and extent of the obligation of religious poverty, as vowed in the order. Francis desired that it should be understood in the most rigorous sense; and, in his scheme of poverty, neither the individual brethren nor the entire community could acquire or retain any right of property even in things of necessary use. The rigorous party in the order sought to carry out this principle to the fullest extent; and they contended that it was unlawful for the order to acquire a right of property in houses, convents, or even churches; restricting their right in everything which they possessed to the simple use. Several successive popes sought, by explanatory decrees, to settle the dispute; and for a time a compromise was received, by which it was understood that the right of property in all *de facto* possessions of the order was vested in the see of Rome; but the foundations of the real controversy lay deeper than this. They regarded the practice, far more than the theory, of poverty; and the disputes to which they led eventuated not only in the formation of fresh offsets from the body in the new religious orders to be named hereafter, but also in a large, and, for a time, formidable, secession from the church in the sect of the Fraticellians. See FRATICELLIANS.

The supreme government of the Franciscan order, which is commonly said to be the especial embodiment of the democratic element in the Roman Catholic Church, is vested in an elective general, who resides at Rome. The subordinate superiors are, first, the 'provincial,' who presides over all the brethren in a province; and secondly the 'guardian,' who is the head of a single convent or community. These officers are elected only for two years. The provincial alone has power to admit candidates, who are subjected to a probation of two years (see Novitiate); after which they are, if approved, permitted to take the vows of the order. Those of the members who are advanced to holy orders undergo a preparatory course of study, during which they are called 'scholars;' and if eventually promoted to the priesthood, they are styled 'fathers' of the order; the title of the other members being 'brother' or 'lay-brother.'

A very important feature, however, of the organisation of the Franciscan, as it subsequently became of other orders, is the enrolment of non-conventual members, who continue to live in society without the obligation of celibacy; and in general, are only bound by the spirit, and not the letter, of the rule. They are called 'Tertiaries,' or members of the Third Order of St Francis. See Tertiary. It is impossible to overestimate the value of this institution in the disorganised social condition of that age. The Tertiaries were bound, as the very first condition of enrolment, to restore all ill-gotten goods; to be reconciled with all those with whom they had been at feud; to devote themselves to the practice of works of Christian charity; to avoid all unnecessary expenditure; to renounce the use of personal ornaments; to hear mass daily; to serve the sick and the hospitals; to instruct the ignorant; and, in a word, to practise as far as possible in the world the substance of the virtues of the cloister. The institute, in this form, undoubtedly exercised a powerful influence in medieval society. It counted members in every rank, from the throne to the cottage; and, although it was in some instances deformed by abuses and superstitious practices, the aggregate results were undoubtedly beneficial.

The Franciscan order has been the parent of many other religious institutes. The earliest of these is that of the 'Observantists,' or 'brethren of more strict observance.' The origin of this body has been already indicated. The party in the order which contended for the more rigid observance of the rule, after a protracted struggle—in which disaffection to the church itself was often strongly exhibited (see Spiritualists)—obtained a separate organisation, which may be said to have been finally settled at the time of Leo X. The less rigid party, under the name of 'Conventuals,' obtained a distinct general, and an authorisation for their mitigated observance of the rule. Their churches and convents admit greater richness of architecture and decoration; and they are at liberty to acquire and retain, in the name of the order, the property of these and similar possessions, all of which are renounced by the Observant Franciscans. The latter community comprises nearly 150 provinces. Their constitution is that of the original rule, as already explained. A second offshoot of the Franciscan order, and in the same direction of rigorism, is that known as the 'Capuchin,' founded by Matteo di Basio, a Franciscan brother of the Observant rule, in the early part of the 16th century. Believing himself divinely called to revive the old spirit of his order, and learning that the modern habit of the brethren was different from that of St Francis, he began with externals, and procured for himself, and obtained the papal permission to introduce (1528), the peculiar habit, with a pointed hood or cowl (capute), from which the name of the reformed order is derived. Along with this habit, however, Matteo adopted a very rigorous and mortified course of life, in which he was joined by others of the brethren; and the reform spread so rapidly among the community, that in the year 1536 a general chapter of the new congregation was held. They were subject, however, to the jurisdiction of the general of the Franciscan order. One of the first generals of the new reform was Bernardino Ochino, afterwards notable by his defection to Calvinism. After the Council of Trent, the Capuchins multiplied rapidly, though they were not introduced in France till the end of that century. A similar reform, to which the name of 'Recollets' was given (introduced in Spain by John de Guadaloupe, in 1500), was approved by Clement VII. in 1532; and many of the new brethren were among the first Spanish missionaries to the New World. A further development of the rigoristic spirit is the congregation of 'Discalced' or 'Barefooted' (q. v.) Franciscans. The author of this reform was a Spanish Capuchin, Peter of Alcantara. In his capacity of provincial of Estremadura, Peter introduced many reforms; and in 1555 obtained the approval of Pope Julius III. for a new rule, which was afterwards confirmed by Pius IV.

The notice of the Franciscan institute would be incomplete without the mention of the several orders of nuns; as those of St Clare, the Capuchinesses, the Urbanist nuns, &c., which formed part of the same general organisation. None of these, however, calls for any detailed explanation, or presents any very characteristic features.

The Franciscan order, in these several branches, has at all times maintained its popularity in the Roman Catholic Church. When Helyot, in the beginning of the 18th c., published his great *History of Religious Orders*, the Franciscan order numbered nearly 120,000 friars, distributed over above 7000 convents, and nearly 30,000 nuns, occupying about 900 convents. Since the French Revolution, the number has of course been very much diminished, the order having been suppressed in more than one kingdom; but it is still one of the most numerous in the Roman Catholic Church. Many of the foreign missions are mainly supplied by Franciscans, and they possess convents in almost every part of the world.

As a literary order, the Franciscans have chiefly been eminent in the theological sciences. The great school of the Scotists takes its name from John Duns Scotus (see Scotus), a Franciscan friar, and it has been the pride of this order to maintain his distinctive doctrines both in philosophy and in theology against the rival school of the Thomists, to which the Dominican order gave its allegiance. See Thomists. In the Nominalistic controversy, the Thomists were for the most part Conceptualists; the Franciscans adhered to the rigid Realism. See Nominalism. In the Free-will question, the Franciscans strenuously resisted the Thomist doctrine of 'predetermining decrees.' Indeed, all the greatest names of the early Scotist school are the Franciscans, St Bonaventure, Alexander de Hales, and Ockham. The single name of Roger Bacon, the marvel of medieval letters, the divine, the philosopher, the linguist, the experimentalist, the practical mechanician, would in itself have sufficed to make the reputation of his order, had his contemporaries not failed to appreciate his merit. Two centuries later, the great Cardinal Ximenes was a member of this order. The Popes Nicholas IV., Alexander V., Sextus IV., the still more celebrated Sixtus V., and the well-known Ganganelli, Clement XIV., also belonged to the institute of St Francis. In history, this order is less distinguished; but its own annalist, Luke Wadding, an Irish Franciscan, bears a deservedly high reputation as a historian. In lighter literature, and particularly poetry, we have already named the founder himself as a sacred poet. Jacopone da Todi, a Franciscan, is one of the most characteristic of the medieval hymn-writers; and in later times, the celebrated Lope de Vega closed his eventful career as a member of the third order of St Francis. We may add that in the revival of art the Franciscan order bore an active and, it must be confessed, a liberal and enlightened part. See Wadding, *Annales Minorum Fratrum*, 8 vols.; see also Milman's *Latin Christianity*, vol. v.

FRANCISCO, San. See San Francisco.

FRA'NCKÉ, Aug. Herm., a distinguished German philanthropist, founder of the Orphan Asylum and several educational institutions at Halle, was born at Lubeck in 1663. Having studied languages and theology with great application and success, he first attracted attention by his academical biblical lectures in Leipsic, begun about 1685. These were more distinguished for piety, warmth, and zeal, than for attention to the strict and dry orthodoxy then in vogue; and the reception they met with from the public brought on F. envy and persecution as a heretic. He thought proper to yield to the storm, and withdrew in 1690 to Erfurt. In 1692, he obtained the professorship of Oriental languages in the newly instituted university at Halle, where he subsequently held a professorship of theology. He also received the pastoral charge of the suburb of Glaucha. The ignorance and poverty of his parishioners gave the first impulse to his benevolent labours. To the neglected poor and children that came to him for alms, he gave instruction on stated days, and as others joined, paying a school-fee of a penny a week, and the numbers rose to some sixty, he divided them into classes, and thus laid the first foundation of his educational establishments. At the same time the thought suggested itself of an orphan asylum, and in 1698 he laid the foundation of a special building for the asylum. Some years after, he erected a Pedagogium, a Latin school, and a boarding establishment connected with it. In 1714, there were 1075 boys and 700 girls receiving instruction from 108 teachers under the direction of Francke. He also had a missionary institution for the East Indies. To erect and maintain all these establishments required large sums of money; and it is surprising how F. succeeded in obtaining it without assistance from government. But so high was his reputation for disinterested benevolence, and in such a practical way did he set about his undertakings, never appealing for the charitable aid of others till he had first effected something himself, that contributions flowed in from all parts of Germany, and even from abroad. F. also instituted an apothecary's shop and bookselling in connection with his other operations, and thus obtained a considerable income for their support. Nor amidst all these voluntary labours did he neglect his duties as professor and pastor; he preached and lectured regularly, and also found time to study and write. He died June 8, 1727.

Francke's Institution, as it now exists in Halle, embraces the orphan house and schools erected by F., together with others since added; the number of pupils amounting in all to upwards of 2000. Bookselling, printing, and a laboratory for the preparation and distribution of medicines are also carried on in connection with education. The revenues consist of the profits of this industry, of the income from some property in land and funds, and of an allowance of £6000 from the state. The education imparted retains its religious character, but the excessive number of prayers and the otherwise conventual and ascetic character of the discipline have been diminished.

FRANÇOIS, St, is the name of two towns in the French West Indies.—1. St F. in Guadeloupe stands on the Grande Terre, the more easterly of the twin islands into which the colony is divided by an arm of the sea known as Salt River. It contains about 6600 inhabitants, about 5600 of them having been slaves down to 1848, the epoch of emancipation under the French Republic.—2. St F. in Martinique possesses a good harbour on the east coast. Of a population of 5966, 4272 had been slaves.

FRA'NCOLIN (*Francolinus*), a genus of birds of the family *Tetraonidæ*, closely allied to partridges, but distinguished by a stouter bill, a larger tail, and generally by a spur—in some species, two spurs—on the tarsus of the male. They are natives of Europe, Asia, and Africa. One species only, the European F. (*F. vulgaris*), is found in the most southern parts of Europe; it inhabits also the north of Africa and great part of Asia. It is a beautiful bird; the plumage of the male is richly coloured. It frequents watery places, and feeds much on the tender tops of herbs. One (*F. Ponticerianus*) is very common in many parts of India, and is called Partridge in the Deccan, although it differs much in appearance from partridges, on account of its large rounded tail. Another (*F. spadiceus*) abounds in some of the mountainous parts of India; and Africa has a number of species, some of which scrape up bulbs for their food. The Francolins generally inhabit forests and thickets, and roost in trees.

Gray Francolin (*Francolinus Ponticcrianus*).

FRANCO'NIA (Ger. *Franken*). This name was first applied to those districts on both sides of the Maine which were originally peopled by colonies of Franks, under Thierry, the eldest son of Clovis, who inherited the Germanic possessions of his father on the death of the latter in 511. Under the Merovingian and Carlovingian dynasties, this province acquired a certain degree of preponderance in the state, and enjoyed the privilege of electing the king of the Germans within its own territories, and crowning the sovereign by the hands of its archbishop (Mayence), who was primate of the empire. In 911, Conrad, the Count or Duke of Franconia, for there is some doubt which of these titles was at that time borne by the ruler of the province, was raised to the throne; and a century later, after the ducal dignity had been recognised in F., the choice of the electors again fell upon the Franconian House, which, by its direct and collateral branches, gave kings and emperors to Germany from 1024, when Conrad II. began his reign, till 1250, when the indirect line of the Hohenstauffen family became extinct. During its connection with the crown, F. increased in extent and importance, while its great spiritual principalities of Mayence, Spires, Worms, and Würzburg acquired both wealth and political influence. In the course of the following 200 years, the province underwent various modifications, and was subdivided into numerous territories, as those of the Rhenish County-palatine, Nassau, Katzenellnbogen, Hainau, the landgravate of Hesse, &c., until the name of F. was limited to the eastern portions of the ancient duchy, which included Würzburg, Fulda, Bamberg, Nürnberg, Hohenlohe, &c. In 1512, Maximilian I. re-established the circle of F., which then embraced the sees of Bamberg, Würzburg, and Eichstädt, Baireuth and Anspach, and several counties and cities. With the dissolution of the empire, the name of F. disappeared from among the political divisions of Germany; but since 1837 it has been revived in the kingdom of Bavaria (q. v.), where those portions of the ancient Franconian province, which in modern times have been known as the circles of the Upper Maine, Rezat, and Lower Maine, are now designated Upper, Middle, and Lower Franconia. Upper F. includes the north-east portion of Bavaria. It is watered by numerous rivers, as the Maine, Raab, Saale, &c., and is intersected by the Fichtelgebirge and by the hilly ranges of the Böhmer-, Franken-, and Steiger-Wald. The valleys produce good crops and fruit, and the district is rich in minerals. There are 38 civic and rural circles of jurisdiction in this province; capital, Baireuth. Middle F., which abuts upon Würtemberg, is intersected by branches of the Franconian Jura chain, but has few rivers of importance besides the Regnitz and Altmühl, which are connected by the great Ludwig Canal. It produces good wine, but is principally celebrated for its hop-gardens. The chief towns are Anspach and Nürnberg, and it has 30 civic and rural circles of jurisdiction. Lower F. cum Aschaffenburg, which occupies the north-west part of Bavaria, is traversed by the Spessart- and Rhöngebirge and the Steiger-Wald, and watered by the Maine and Saale. It is the richest and best cultivated of the Franconian circles, and is celebrated for the excellence of its wines, the Steiner and Leister. The district is noted for its mineral springs at Kissingen, Brückenau, Orb, and Wipfeld. It is divided into 47 circles of jurisdiction; capital, Würzburg.

FRANEKER, a handsome town of the Netherlands, in the province of Friesland, situated on the canal between Harlingen and Leeuwarden, and 10 miles west of the latter place. It has won a name in the literary world as having been the seat of a university founded in 1585 by the Frisian states on the suggestion of Prince William Louis, Count of Nassau, and which ranked among its professors the eminent names of Vitringa, Schultens, Hemsterhuis, Valckenaer, and others. It was, however, abolished by Napoleon in 1811, and in 1816 was transformed into an athenæum, to which a physiological cabinet and botanic garden belong. F. also possesses a celebrated orrery. Pop. 5500.

FRANGIPANI, an illustrious and powerful Roman House, which traces its origin to the 7th c., and attained the summit of its glory in the 11th and 12th centuries. In the early annals of Rome, several members of this family occupied important public offices, and seem to have taken a prominent lead in all matters of moment. In 987, Crescenzio Frangipani successfully vindicated the prerogatives of the Roman people against the encroachments of Pope John XV. The rivalry of the F. House with that of the Pietro Leoni, not only occasioned repeated civil wars in the state, but likewise several schisms in the church. The lustre of their race was finally outshone by the two great patrician families, Colonna and Orsini, whose magnificence, power, and pretension far exceeded those of the greatest citizens of Rome. Two of the last of the F. who merit mention are Giovanni, who captured Conradin of Hohenstaufen, and delivered him, in 1268, to his sanguinary enemies; and Latino, Grand Inquisitor and Cardinal and Bishop of Ostia and Velletri. The origin of the name Frangipani is attributed to the family's benevolent distribution of bread in time of famine.—The Croatian family of the same name claim descent from the great original Roman House.

FRANK, FRANKING LETTERS. On the introduction of the uniform penny-postage on all inland letters in 1840 (3 and 4 Vict. c. 96), the privilege formerly enjoyed by peers and members of the House of Commons, and many official persons, of '*franking*,' as it was called, that is, sending and receiving letters duty free, was abolished; the statute 7 Will. IV. and 1 Vict. c. 32, by which this privilege had been recently regulated, being repealed by s. 68 of the first-mentioned act. The privilege was claimed by the House of Commons in 1660, when the post-office was first legally established (see POST-OFFICE), but it was afterwards dropped upon a private assurance from the crown that it should be allowed to members. The postmaster-general accordingly constantly issued a warrant directing the allowance, till the privilege was expressly conferred by statute 4 Geo. III. c. 24. In the days of franking, each member of either House of Parliament was entitled to send ten letters every day, not exceeding an ounce in weight each, to any place in the United Kingdom, and to receive fifteen, free. As it was not necessary that the letter should be either written by or to the privileged person, the privilege was greatly abused; and most persons whose memories reach back to the period when it existed, will remember family arrangements for taking advantage of it, by which the whole correspondence of the kindred, connections, and even the intimate acquaintances of a peer, or a member of parliament, was in general carried on duty free. Up to the passing of the last-mentioned statute (12th July 1837), all that was requisite was that the member should write his name or title on the corner of the letter. From this time, however, till the abolition of the privilege, it was required that the whole address should be written by the member; that he should add not only his name, but the name of the post-town, and the day of the month; and what was most troublesome of all, that the letter should be posted on the day on which it was written, or the following day, and in a post-town within 20 miles of which the person franking was then actually resident. By this cruel regulation (7 Will. IV. and 1 Vict. c. 35, s. 9), the kindly custom of giving franks to friends, or leaving them with them for future use, was rudely interfered with, and the public mind reconciled to the final abolition of what many regarded as a time-honoured abuse.

FRANKALMOI'GNE (Lat. *libera eleemosyna*, free alms) was a gift of lands to those who were consecrated to the service of God. By the ancient common law of England, a man could not alien lands which came to him by descent without consent of his heir, but he might give a part to God in free alms. It was an old Saxon tenure, and continued under the Norman revolution, through the great respect that was shewn to religion and religious men. This is the tenure by which almost all the ancient monasteries and religious houses held their lands, and by which the parochial clergy and very many ecclesiastical foundations hold them at this day. The statute of 12 Car. II. c. 24, which abolished the old tenures, specially reserved tenure in frankalmoigne. The condition on which lands in frankalmoigne were held was, that masses and divine services should be said for the grantor and his heirs, but no particular service was specified. At the Reformation, the nature of the services was changed, but the tenure was suffered to continue. A tenant in frankalmoigne did no fealty to his overlord, and in the event of failure to perform the service, the latter was not entitled to distrain, but might complain to the ordinary or visitor. In this respect, this tenure differed from tenure by divine service, i. e., where lands were given on condition of performing a specified service, as saying a mass on a particular day, or distributing certain alms. In this case, the tenant was bound to render fealty, and the lord was entitled to distrain on failure to perform the service. But lands held in frankalmoigne were subject to the *trinoda necessitas*, of repairing highways, building castles, and repelling invasions. Frankalmoigne was a tenure, to be held of the grantor and his heirs; all lands, therefore, now held in frankalmoigne, unless created by the crown, must have been granted before the reign of Edward I., for by *Quia emptores*, 18 Edw. I., all grants by subjects to be held of the grantor and his heirs are ineffectual. In Scotland, lands conveyed to the church *in puram eleemosynam* were said to be mortified. See MORTIFICATION.

FRA'NKENBERG, a flourishing manufacturing town of the kingdom of Saxony, is beautifully situated on the right bank of the Zschopau, an affluent of the Mulde, 32 miles south-west of Dresden. It has manufactures of cottons (with cotton printing), linens, leather, and machinery. Pop. 7660.

FRA'NKENHAU'SEN, a small town of Germany, in the principality of Schwarzburg-Rudolstadt, stands on the Wipper, 27 miles north-north-west of Weimar. It is surrounded with walls, pierced by eight gates, has a palace, a Latin school, a productive salt-work, and a saltpetre refinery. Pop. 5000, who are engaged chiefly in the corn and wool trade, and in the production of wine. F. figures in history as the scene of a battle between the rebellious peasants under Thomas Münzer, 15th May 1525, and the Saxon, Brunswick, and Hessian troops, in which the former were defeated.

FRA'NKENSTEIN, a small but active town of Prussia, in the province of Silesia, is situated on a height on the left bank of the Pause, 37 miles south-south-east of Breslau. It is surrounded with walls which are entered by four gates, and consists of the town proper with four suburbs. Seven miles south-west of F. is the mountain fortress of Silberberg, the defences, bastions, and casemates of which are almost entirely hewn out of the solid rock. These works were constructed by Frederick the Great, in order to command the passage from Bohemia. Pop. 6198, who are engaged in the manufacture of broadcloth, linen, aquafortis, strawplait, saltpetre, &c.

FRA'NKENTHAL, a prosperous manufacturing town of Germany, in the Bavarian Palatinate, is situated on the Isenach, 16 miles north-north-west of Spires. From the town, a canal between 50 and 60 feet broad extends east to the Rhine, a distance of three miles. It has important cloth manufactures, cotton and linen weaving, and manufactures of gold and silver wire, and of needles, files, and tobacco. Pop. 5600.

FRA'NKFURT-ON-THE-MAINE (Ger. *Frankfurt am Main*), the most ancient and important of the free cities of Germany, is situated on the right bank of the Maine, in lat. 50° 6′ N., and long. 8° 40′ E. The population of the city was, according to the census of 1858, 67,975, and that of its dependent villages, 11,303, exclusively of the federal troops, which are quartered at F. as the seat of the German Diet. F. possesses a small territory (about 39 square miles), lying immediately beyond the precincts of the city, and watered by the Maine. The soil, which is deep sand covered with a substratum of lava, is admirably adapted for the growth of corn, the vine, and other fruits. F. is the centre from which radiate public roads and railways to every part of Germany; while its site on the banks of the Maine, 20 miles from its confluence with the Rhine, by affording it a direct channel of water-communication with the German Ocean, secures to it great advantages as a seat of commerce. Its central position has pointed it out from the earliest ages of the history of Germany as a suitable place for national meetings, and in 794 Charlemagne convoked a council here. In 843, F. was made the capital of the eastern Frankish empire, and continued so till 889, when Arnulf transferred that honour to Ratisbon; in 1257, F. was raised to the dignity of a free city; and in 1356, Charles IV. confirmed by the famous 'Golden Bull' the right, which it had enjoyed since the days of Frederic Barbarossa, of being the place for the election of the emperors of Germany. The Guildhall, or *Roemer*, contains the Wahlzimmer, or Hall of Election, in which the Electors (q. v.) met to deliberate on the nomination of the emperors, and the *Kaisersaal*, or Imperial Hall, in which the newly elected monarch held his public dinner, at which he was waited upon by the counts and high officers of the empire, who held their respective domains and offices in right of their performing various acts of service on that occasion. Round this hall are ranged in niches the portraits of the emperors from Conrad to Leopold II. The Golden Bull is preserved among the archives. The ancient cathedral, St Bartholomew's, contains the chapel in which the electors accepted the emperor after he had been anointed at the high-altar. F. still contains many old and narrow streets with high-gabelled projecting houses, but its ancient walls and ramparts have been converted into pleasure-walks, and there are now broad quays, and wide handsome streets in the more modernised parts of the city. The famous *Juden-gasse*, or Jews' Street, has lost its ancient characteristics since a more liberal policy has permitted members of the Jewish persuasion to live in whatever quarter they choose. The gates, which secured the street at either end, and were closed at night to prevent the egress of the Jewish inhabitants, were razed at the time of the French occupation in 1806. F. is connected with its suburb, Sachsenhausen, which lies on the left bank of the Maine, by a bridge of 14 arches, originally built about the year 1342. There are fountains in several of the squares, one of which is adorned with a fine statue of Goethe, who was born at F., and another with a group commemorative of the invention of printing. F. possesses several good public libraries, museums, and galleries, and many charitable institutions. It derives great wealth from its banking transactions; the aggregate capital of its bankers, among whom the name of the Rothschilds has long stood foremost, is said to be about 20 millions sterling, and the annual transactions in bills of exchange about 12 millions sterling. Its manufactures are snuff, tobacco, jewellery, printers' black, wax-cloths, and carpets. In 1855 it was decreed that the executive body should consist of 4 syndics and 21 members of the civic committee, with 2 burgomasters, elected annually, as its presidents, of whom the senior draws up reports for the senate, and has the control of the military, while the junior presides over police and corporate proceedings. The lower or legislative chamber is composed of 57 members, and the highest court of appeal is the supreme tribunal at Lübeck. F., in conjunction with the other free cities, occupies the 17th place in the limited council of the Diet, but enjoys an independent vote in the full council. It furnishes a contingent of 783 and a reserve of 336 men to the army of the Confederation. The Constituent Assembly elected in 1848 to frame a constitution for Germany, held its sittings at F., which was for some years the scene of violent political excitement; but as the greater German powers refused to accede to the decisions of the assembly, no permanent result tending to the union of Germany was secured by these deliberations.

FRANKFURT-ON-THE-ODER, the capital of an extensive Prussian circle of the same name in the province of Brandenburg, is a place of considerable trade, on the railway line between Berlin and Breslau, and about 50 miles east of the former city. F. lies in lat. 52° 22′ N., and long. 14° 20′ E. Pop. in 1860, 32,800. It is a fortified, well-built town, and has three suburbs, one of which lies on the right bank of the Oder, and is connected with the remainder of the town by a wooden bridge. Of the six Protestant churches, St Mary's, founded in the 13th c., is the most worthy of notice, for its large organ, richly gilt wood-carvings, and fine stained windows. The university, founded in 1506, was incorporated in 1811 with that of Breslau, but F. still has its distinct gymnasium, with its branch-schools. Three great fairs are still annually held at F., but although they are still attended, as of old, by many Poles and Silesians, sales are less brisk than in former times. F. has manufactures of silk, leather, gloves, tobacco, sugar, and porcelain ware; it has considerable distilleries, and is noted for its mustard. Its situation on a navigable river, connected by canals with the Vistula and the Elbe, affords great commercial and social advantages, which have rendered it a place of importance from a very early period. It was a flourishing member of the Hanseatic League, and during the middle ages it suffered frequently at the hands of marauding enemies. It was besieged in 1430 by the Hussites, in 1450 by the Poles, and in 1477 by the Duke of Sagan. In the Thirty Years' War, it was frequently taken by both parties, and at the beginning of the present century it suffered severely at the hands of the French. F. is the seat of the administrative government, judicial tribunal, council of nobility, and boards of taxation for its circle. The village of Kunersdorf, 4½ miles from F., was the scene of a great battle, fought August 12, 1759, between Frederick the Great and the Russo-Austrian forces, in which the former, after a sanguinary engagement, was compelled to retreat with great loss.

FRA'NKINCENSE (*thus*), a name employed to designate various fragrant resinous substances which diffuse a strong fragrance in burning, and are on that account used in certain religious services. There is good reason to believe that the frankincense of the Jews, and also of the ancient Greeks and Romans, was chiefly or entirely the substance now known as *Olibanum* (q. v.), the produce of an Indian tree, *Boswellia serrata* or *thurifera*. See BOSWELLIA. It was formerly supposed to have been obtained from the *Juniperus Lycia*, which is now believed not to yield any such product, and is a native of the south of Europe, whilst the prized frankincense of the ancients was brought from the East.—Several trees, however, of different natural orders, yield substances used as frankincense instead of olibanum, in different parts of the world, as several species of *Icica* and of *Croton* in America; and the silver fir (see FIR) in Europe, the resinous product of which is the COMMON FRANKINCENSE of the pharmacopœias, although in the shops, concrete American turpentine is very often sold under this name. It is used in the composition of stimulating plasters, &c. *Burgundy pitch* is made from it. It is a spontaneous exudation from the tree, hardening by exposure to the air, and generally of a whitish or pinkish colour, with a rather agreeable odour and a balsamic taste.

FRA'NKLIN. The franklin, or, according to the old spelling, the frankelein, was the English freeholder of former times, who held his lands of the crown, free (frank) from any feudal servitude to a subject-superior. Chaucer's *Franklin's Tale*, and still more his description of the franklin in the prologue to his immortal Pilgrimage, have rendered him a classical character. In the whole circle of our literature there is probably no more perfect picture of the person, habits, and surroundings of a jovial old country gentleman. His beard was white as a daisy, his complexion sanguine, he loved a 'sop in wine,' and woe to his cook if his sauce were not poignant and sharp; in a word, 'he was Epicurus' owen son.' But the franklin's luxuries were not intended for his own enjoyment alone, for 'a householder, and that a great, was he.' His table stood 'in his hall alway,' 'ready covered all the longe day;' and

> Withouten baked meat never was his house,
> Of fish and flesh, and that so plenteous,
> *It snowed in his house of meat and drink.*

Nor was it only in dispensing good cheer that the franklin fulfilled the functions of the country gentleman of his day. At sessions, he was 'lord and sire,' and full often time he had been 'knight of the shire.' He had been sheriff too, and a countour and vavasour; though what these latter offices were, is a subject of controversy amongst the commentators. 'The dress of the franklin, according to the Duke of Sutherland's MS.,' says Mr Saunders, in his excellent little book called *Cabinet Pictures of English Life* (p. 204), was a surcoat of red lined with blue, with bars or stripes of fringe or lace over it. He wore a small blue hat turned up, and black boots.' Chaucer adds to his attire a knife or dagger called an 'anelace,' and a 'gipciere' or silk purse, 'white as morrow [morning] milk,' at his girdle. Mr Saunders mentions (*ut sup.*) that in the Metrical Chronicle of Robert de Brune, the franklin of an earlier period (13th c.) is ranked immediately after earls, barons, and lords, and was evidently a person of great consideration. Such, as we have seen, was very much his position in Chaucer's time, but he seems to have fallen in dignity, and we find him in much lower company in Shakspeare's day. In *The Winter's Tale* the clown is made to say (Act v. scene 2):

> Not swear it, now I am a gentleman
> Let boors and franklins say it, I 'll swear it.

From other passages it would seem that his position had come to correspond to that of the well-to-do yeoman. In 1 Henry IV., Act ii. scene 1, we hear of a franklin 'in the wold of Kent hath brought three hundred marks with him in gold;' and *Cymbeline* says (Act iii. scene 2), 'Provide me presently a riding suit, no costlier than is fit a franklin's housewife.' There seems no reason to think, however, that Dr Johnson's remark that franklin is 'not improperly Englished a gentleman servant,' is warranted by his position at any period, and it certainly is not by the passage which he quotes from the *Fairy Queen:*

> A spacious court they see, &c.,
> Where them does meet a franklin fair and free.

FRANKLIN, Benjamin, an eminent American philosopher and statesman, born at Boston, in Massachusetts, the 17th of January 1706. He was the youngest son and fifteenth child out of a family of seventeen children. His father, Josiah Franklin, emigrated from England to America in 1685: he followed the business of tallow-chandler and soap-boiler. Benjamin, when only ten years old, was employed in his father's shop in cutting wicks, going errands, &c.; but becoming soon disgusted with the monotonous routine of his duties, he conceived a strong desire to go to sea. To prevent this, his father bound him apprentice to his brother James, who was a printer. Young F. had now free access to books, for which he had evinced a fondness even from infancy. He himself says he could not remember the time when he did not know how to read. To gratify his thirst for reading, he would often sit up the greater part of the night. He did not, however, neglect his duties as printer, and he became in a few years well skilled in his trade. But the two brothers could not agree. The elder appears to have been of a severe and passionate temper, which the younger, as he himself intimates, may have sometimes provoked by his impertinence. At length, when seventeen years of age, young F. left Boston without the knowledge of his relations, embarking in a vessel bound for New York, whence he proceeded, partly by water, and partly on foot, to Philadelphia. Here he obtained employment as a journeyman printer. In the following year, encouraged by the promise of assistance from a gentleman in Philadelphia, he resolved to set up business for himself. With this view, he went to England, in order to purchase type and other materials necessary for carrying on his trade. But failing to receive the aid which he had expected from his pretended friend, he was obliged to work as a journeyman in London, where he remained more than a year. He returned in 1726 to Philadelphia, and in 1729, with the assistance of some friends, established himself in business. The next year he married Miss Deborah Read, with whom he had become acquainted in Philadelphia before he went to England. In 1729, F. had become the proprietor and editor of a newspaper (*The Pennsylvania Gazette*), which his talent for writing soon rendered very popular and very profitable. In 1732, he commenced the publication of an almanac, purporting to be by Richard Saunders. He sought to make his almanac, like his paper, the vehicle of useful information for the people, especially inculcating the virtues of frugality, industry, &c. It was commonly called *Poor Richard's Almanac*, under which name it acquired a wide celebrity.

By his talents, prudence, and integrity, F. continued to rise in the estimation of the community in which he lived, until he was deemed worthy of the highest honours which his country could bestow. He was made successively clerk of the Assembly of Pennsylvania (1736), Postmaster of Philadelphia (1737), and Deputy Postmaster-general for the British Colonies (1753). A dispute having arisen between the Assembly and the proprietary governors, in consequence of the latter claiming exemption from taxation, F. was sent in 1757 to England to plead the cause of the people before the privy council. His representations and arguments prevailed, and it was decided that the estates of the proprietaries should bear their due proportion of the public burdens. On his return in 1762, he received the thanks of the Assembly for the able and faithful fulfilment of his mission.

F. had already become distinguished in the scientific world by his successful experiments on the nature of electricity. In 1752, he had made the important and brilliant discovery of the identity of lightning with the electric fluid. Soon after, the Royal Society of London, even without waiting for any application to be made on his behalf—which had been the general usage—chose him a member of their body, and bestowed upon him the Copley gold medal. Alluding to F.'s account of his electrical experiments, Sir Humphry Davy observes: 'A singular felicity of induction guided all his researches, and by very small means he established very grand truths. The style and manner of his publication are almost as worthy of admiration as the doctrines it contains. . . . He has written equally for the uninitiated and for the philosopher.'

In 1764, F. was again sent by the Assembly as agent to England. The policy of taxing the colonies had already been agitated, and he was instructed by the Assembly to use his efforts against such a measure. But the ministry had formed their plans, and the Stamp Act was passed early in 1765. It caused a great excitement, and met with the most determined opposition in America. At the beginning of 1766, a new ministry having come into power, the subject was again brought to the attention of parliament. F. was examined before the House of Commons, on which occasion his talents, his varied information, and his presence of mind, were shewn to great advantage, and the repeal of the obnoxious Stamp Act was the result. But other laws deemed equally objectionable remained in force. In the dispute between the American colonies and the mother-country, F. had sought sincerely and earnestly to prevent a disruption; when, however, he became convinced that a separation was inevitable, he returned home, and took an active part in promoting the cause of independence. He arrived at Philadelphia on the 5th of May 1775, after an absence of rather more than ten years. The day after his arrival, he was unanimously elected by the Assembly of Pennsylvania a delegate to the Second Continental Congress then about to assemble. He was one of the committee of five chosen by congress to prepare the celebrated 'Declaration of Independence,' which, having been unanimously agreed to on the 4th of July 1776, he afterwards signed with the other leading patriots. Towards the close of the same year, he was sent as ambassador to the French court. To him is due the principal, if not the sole, credit of effecting between France and the United States the Treaty of Alliance, the stipulations of which were so eminently favourable to the latter country. This treaty, signed at Paris the 6th of February 1778, may be said to have secured the independence of the American colonies. F. remained in Europe some time after the establishment of peace. In 1785, he returned to Philadelphia, where he died on the 17th of April 1790, aged 84 years.

In person, F. was of a medium stature, well formed, and strongly built, with a light complexion, and gray eyes. His manners were affable and engaging. He was remarkable for simplicity of character, and practical common sense. He deemed nothing which concerned the interest or happiness of mankind unworthy of his attention, and rarely if ever bestowed his attention on any subject without obtaining permanently useful results.

He left among his numerous works an extremely interesting and instructive autobiography of the earlier portion of his life, extending to his fifty-second year. A complete collection of his works, edited by Jared Sparks, has been published in ten volumes octavo.

Of F.'s living posterity, there is none bearing his name. Among the descendants of his daughter Sarah, who was married to Richard Bache, several have risen to eminence in science or literature.

FRANKLIN, Rear-admiral Sir John, an English naval officer of distinguished reputation, was born at Spilsby, in Lincolnshire, April 16, 1786. He was descended from a long line of freeholders, and was the youngest son of a respectable yeoman. F. received the rudiments of his education at St Ives; afterwards he spent two years at the grammar school of Louth. It is stated that he was intended for the church, but as he displayed a decided predilection for the sea, his father wisely abandoned opposition to his choice of a profession, and procured him, in 1800, a midshipman's post on board the *Polyphemus* line-of-battle ship. In the following year, F.'s ship led the van in the desperate battle of Copenhagen. Two months after, he was removed to the *Investigator*, then fitting out under command of Captain Flinders, for discovery and survey of the Australian coast. In this expedition, F. had the companionship of the distinguished botanist Robert Brown, and of his coadjutor Ferdinand Bauer, and from them he learned the great importance of the natural sciences, in the promotion of which he ever afterwards took a deep and intelligent interest. On his return to England, F. was appointed to the *Bellerophon*, in which he acted as signal midshipman in the battle of Trafalgar (1805), and had the good-fortune to escape unhurt. He subsequently served in the *Bedford* on various stations, and took a distinguished part in the attack on New Orleans in 1814. In 1819, F. was despatched by government to Hudson's Bay, with orders to make his way thence to the Arctic Sea, and survey as much of the coast as possible. In the course of this expedition, which lasted about three years and a half, F. travelled 5550 miles under circumstances of the greatest hardship and privation, to which more than half of his companions succumbed. But the gain to science was great, alike from the carefulness and extent of the physical surveys of the mouth of the Coppermine River, and eastward along Coronation Gulf, and from the attention devoted to the natural productions of these inclement shores. On his return, in 1822, F. was made post-captain, and elected a Fellow of the Royal Society. In 1825, he co-operated (overland) with the sea-expeditions of Captains Parry and Beechey, and surveyed the North American coast from the mouth of the Coppermine westward to about Point Beechey. F.'s discoveries now extended over 44 degrees of longitude, or more than a third of the distance between Baffin's Bay and Behring's Strait. For these valuable explorations, in which he was engaged until 1827, he received the honour of knighthood from his sovereign, and the degree of D.C.L. from the university of Oxford, while the French Geographical Society awarded him their gold medal, and at a subsequent period he was elected corresponding member of the Institute of France. F. next took an active part in the Greek war of liberation. In 1836, he was appointed governor of Van Diemen's Land, where his wise and moderate conduct secured for him the warm approbation both of the government and the colonists. The latter established a college and a philosophical society in his honour; and years after, they testified that the memory of his rule was still gratefully cherished, by subscribing £1600 towards an expedition designed for his rescue. In May 1845, F., now bordering on his 60th year, but with physical and mental powers undiminished in vigour, started with the *Erebus* and *Terror* on his last and ill-fated expedition to discover the North-west Passage. The last time that the vessels were seen was in July of the same year. To enter into the history of the efforts undertaken for the relief or discovery of the fate of F. would be out of place here. It is sufficient to say, that in the course of eleven years upwards of twenty separate expeditions, at the cost of about a million sterling, were sent out to look for the missing crews; and the discoveries of these expeditions added more to our knowledge of the arctic regions than all previous explorations had done. See North-west Passage. It was not until 1859 that the fate of F. was ascertained by the commander of a little vessel fitted out by Lady Franklin, after hope had been declared hopeless by all else. It then appeared that F. had died on the 11th June 1847, fortunately before his sympathetic heart had been lacerated by witnessing the awful sufferings of his men. F. was one of the boldest and most persevering explorers that Britain ever sent from her shores. His daring was qualified by judgment, and his sense of duty and responsibility as to the lives of those under his charge was of the keenest. His heart was tender as a woman's; and altogether he was one of the noblest types of a true Christian gentleman.

FRANKLIN, Jane, Lady, the second wife of Sir John F., to whose unwearied energy, devotion, and hopefulness, when hope had sunk in all other hearts, we are indebted for the knowledge of the fate of her gallant husband, is the daughter of John Griffen, Esq., of Bedford Place, London, and was married to Sir John Franklin in November 1826. In 1848, when, owing to the long absence of news about the expedition of the *Erebus* and *Terror*, fears began to be entertained about its safety, Lady F. offered large rewards to any persons who should discover and afford relief to the missing voyagers, or who would make exertions with that end in view. From that time until 1857, when she fitted out the *Fox*, under the command of M'Clintock, whose discoveries set all doubts about the fate of her husband's expedition at rest, Lady F. never rested in her efforts to incite by voice, pen, and purse, not only her own countrymen, but Americans, to search for the missing ships and their unfortunate crews. Lady F. is still alive (1862).

FRA'NKMARRIAGE (*liberum maritagium*) was a species of estate tail existing by the common law of England; for where a man, on the marriage of his daughter or cousin, gave lands to be held in frankmarriage, this implied a gift in special tail, to the donees and heirs of their bodies. This tenure was called *liberum maritagium*, to distinguish it from other species of estates tail (*Co. Litt.* 94 b). Four things were necessary to a gift in frankmarriage: 1. That it must be in consideration of a marriage, but it might be as well after as before a marriage. 2. That the donee with whom it is given be of the blood of the donor. 3. That the donees should hold of the donor. Hence a gift in frankmarriage by a subject became impossible after the statute of *Quia emptores*. 4. That the donees should hold for four generations. Therefore a gift in frankmarriage with a reservation of a remainder to a stranger, or a devise by will, was bad.

FRANK-PLEDGE, a law prevailing in England before the Norman Conquest, whereby the members of every tything were responsible for the good-conduct of each other. This responsibility, according to Mr Hallam, consisted in every ten men in a village being answerable each for the others, so that if one committed an offence, the other nine were liable for his appearance to make reparation. Should the offender abscond, the tything, if unable to clear themselves from participation in the crime, were compelled to make good the penalty. This law has been ascribed to Alfred the Great; but it would appear to have been in existence at a much earlier period. Mr Hallam, *Middle Ages*, ii. p. 80 (edit. 1841), observes: 'The peculiar system of frank-pledges seems to have passed through the following very gradual stages. At first, an accused person was bound to find bail for standing his trial. At a subsequent period, his relations were called upon to become securities for payment of the compensation and other fines to which he was liable; they were even subject to be imprisoned until payment was made, and this imprisonment was commutable for a certain sum in money. The next usage was to make people already convicted, or of suspicious repute, give securities for their good-behaviour. It is not till the reign of Edgar that we find the first general law, which places every man in the condition of the guilty or suspected, and compels him to find a surety who shall be responsible for his appearance when judicially summoned. This is perpetually repeated and enforced in later statutes during his reign and that of Ethelred. Finally, the laws of Canute declare the necessity of belonging to some hundred and tything, as well as of providing sureties.'

The *Court of Frank-pledge*, or *Court-leet*, is a court of record held once in the year, and not oftener, within a particular hundred, lordship, or manor, before the steward of the leet: being the king's court granted by charter to the lords of those hundreds or manors. All freeholders resident in the jurisdiction are bound to attend this court; but persons under twelve and over sixty years of age are excused, and by the statute of Marlbridge, 52 Hen. III. c. 10, all prelates, peers, and clergymen, and women are discharged from attendance. It was also the custom to summon all the king's subjects to this court, on attaining years of discretion, to take the oath of allegiance. The business of this court was to present by jury all crimes committed within their jurisdiction, and to punish all trivial misdemeanours. This court has practically fallen into desuetude, and the business is discharged by the justices of the peace at general and petty sessions. See Blackstone's *Commentaries*. Originally, the business of the court of frank-pledge was confined to the taking securities or free pledges for every person within the jurisdiction; but this practice having fallen into disuse, the court gradually acquired a criminal jurisdiction, concurrent with that of the sheriff's tourn. '*Magna Charta* distinguishes between the tourns or leets of sheriffs and the view of frank-pledge; limiting the former to twice a year, and the latter to once. In the more ordinary sense, frank-pledge and leet are synonymous, as appears from the style of tourns and other leets, which in court-rolls are usually denominated *curiæ* or *visus franci plegii*. But when free pledge is used, as in Magna Charta, it should be understood in a strict and particular sense.'—*Co. Litt.* by Hargrave, 115 a, note 10.

FRANKS (i. e., freemen) was the name assumed by a confederation of German tribes that appeared on the Lower Rhine in the 3d c., and afterwards overthrew the Roman dominion in Gaul. It was only the name, however, that was new; the individual tribes composing the confederation had been known on the Rhine as early as the time of Augustus. The most important of these were the Sigambri, Chamavi, Ampsivarii, Chatti, Chattuarii, and Bructeri of the time of the first emperors. In the 3d and 4th centuries, hordes of them began to pour through the Low Countries into Gaul, until at last the country became their prey. After the middle of the 4th c., they appear divided into two groups, the Salians—either from the old Ger. *Sal*, or the river Sala (*Yssel*)—and the Ripuarians (*ripa*, the bank), the first inhabiting Holland and the Low Countries, the last on both sides of the Rhine as far up as the Main. Each group had its own laws, afterwards committed to writing (*Lex Salica* and *Lex Ripuariorum*). Like the two peoples, these laws differ little even in detail. The F. were a mobile, well-endowed race, forming in language and art the transition from the Low Germans to the High; and they compose to this day the ground of the population of the west of Germany as far as the Neckar, Main, Murg, and Lower Alsace, as well as the chief Germanic element of the population of Northern France. For the later history of the Franks, see articles CLOVIS, CARLOVINGIANS, CHARLEMAGNE, FRANCE, MEROVINGIANS, &c.

FRA'NZENSBRUNN, or **FRANZENSBAD**, a small village and well-known bathing-place in Austria, on the north-western frontier of Bohemia, three miles north-west of Eger, is situated amid low bare hills, and consists of four rectangular streets lined with trees. It has four cold mineral springs, chiefly of alkalo-saline chalybeate water, deemed highly efficacious in the cure of scrofulous complaints and diseases of the skin, and used principally for drinking, but also for bathing purposes, in which case the water is heated to a temperature of 90° to 98° F. Nearly 200,000 bottles of these waters are exported annually. F. has also mud and gas baths.

FRASCA'TI, a beautiful town about eight miles east-south-east of Rome, with a population of 5000. It stands on the lower heights of the Alban Hills, not far from the site of ancient Tusculum, which was built on a higher range of hills. Tusculum (q. v.), a town of much more ancient date than Rome, was burned and ruined by the Romans in 1191 A. D., to avenge a former victory gained by the Tusculans in 1167. Those of the inhabitants who escaped the fury of the conquerors, sought refuge on the slope of the hill towards Rome, constructing small huts out of the underwood or *frasche*, and hence the modern name Frascati. The chief attractions of F. are its lovely villas and salubrious air, which attract from Rome in the hot season all its noble and foreign residents, and render this resort in the Alban Hills the most fashionable *villeggiatura* in the vicinity of the Eternal City. The most splendid of these summer residences are the villas Aldobrandini, also known as Il Belvedere, from its commanding and noble prospect; those of Mondragon and Taverna of the Borghese family; the villas Pallavicini and Piccolomini.

The cathedral contains a tablet to the Cardinal of York, for many years bishop of this diocese, and another to his brother, Charles Edward, the Young Pretender, who died here in 1788.

FRASER, SIMON. See LOVAT, LORD.

FRASER RIVER, the principal stream of British Columbia, comprises in its basin the far greater part of the colony. The F. R. proper has its origin in the union of two branches, the more important of which receives its waters from a series of lakes that lie in lat. 54°—55° N., long. about 124° 50′ W., flows in a general south-east direction for 260 miles, and then unites with the other branch, which has its source near Mount Brown, in the Rocky Mountains, lat. 53° N., long. 118° 40′ W., flows north-west, and is 200 miles in length. The point of confluence is near Fort George, in lat. about 53° 25′ N., and in long. about 122° 40′ W., and hence the F. R. flows in a generally southern direction through nearly the whole length of the colony, and after a course of about 600 miles it falls into the Gulf of Georgia between Vancouver's Island and the mainland, barely to the north of the international boundary of 49° of latitude. Its chief affluents are the Stuart and the Chilcotin on the right, and the Thompson on the left. Between the Stuart and the Chilcotin, and on the same side, the F. R. is joined by an affluent, which is rather of historical interest than of physical importance—the West Road River, which took its name from its having been ascended by Sir Alexander Mackenzie, on his adventurous journey of 1793 from the Hudson's Bay Territories to the Pacific Ocean. The F. R. is practicable for steam-boats as far up as Fort Hope, a distance of about 150 miles from its mouth, while about half that distance, as far as New Westminster, it is navigable for large ships. Above Fort Hope, all intercourse is more safely and conveniently conducted by land; and even the aborigines, as their trails still testify, appear to have yielded to the same necessity.

In 1857, the F. R., in its auriferous diggings and washings, began to stand forth as the rival of California and Australia. Since then, the discoveries, originally confined to the lower basin, have steadily become at once more extensive and more productive. Eastward on the Thompson, and more especially northward among the upper waters of the great artery of the country, the precious deposit has given out almost fabulous returns. An apparently authentic communication, dated towards the close of October 1861, regards the daily earnings of £20 for one miner 'as poor this year,' and adds that, even as a hired labourer, a man gets £2 a day. On the practical value of the gold-fields, the peculiar character of the F. R. exercises in various ways a powerful influence. Besides affording comparatively few and scanty facilities for transport, whether upwards or downwards, it directly embarrasses the workings themselves. Generally speaking, the bed is a mere ravine, which rather drains than waters whatever lies beyond its wall-like banks. For operations on the high ground, therefore, the current is rarely, if ever, available; and even the inner margins, flooded, as they periodically are, by the melting of the northern snows, are accessible during only half the year.

FRA'SERA, a genus of plants of the natural order *Gentianeæ*, with a 4-partite calyx and corolla, 4 stamens, and a 2-valvular capsule. *F. Walteri*, a native of Carolina, Virginia, and great part of the basins of the Ohio and Mississippi, is often called American Calumba, the root being imported into Europe under that name. It is a pure and valuable bitter, similar in its effects to gentian. The stem is herbaceous, erect, 3—6 feet high; the leaves oval, oblong, opposite and whorled; the flowers greenish yellow. The plant is a biennial. It grows in marshy places.

FRA'SERBURGH, a burgh of barony and regality and seaport on the north coast of Aberdeenshire, 42 miles north of Aberdeen. It stands on the north-west side of a bay two miles in depth immediately south of Kinnaird's Head (supposed to be the *Taixalorum Promontorium* of the Romans), on which is the Wine Tower, an old castle with a cave below. The town, originally called Faithly, was made a burgh of barony by Queen Mary in 1546. Its name was changed into Fraserburgh (in honour of its proprietor, Sir Alexander Fraser of Philorth) by King James VI. in 1592; and the same king, in 1601, erected it into a free port, free burgh of barony, and free regality. The streets are wide and clean, with substantial houses. Pop. in 1861, 3501, annually increased by 1200 during the herring-fishing in July and August. It is possessed of one of the best harbours on the east coast, erected at a cost of £50,000. The chief exports are oats, barley, meal, potatoes, cured herrings, and cod. At the west end of the town is a quadrangular building of three stories, designed as a college by Sir Alexander Fraser, who in 1592 had obtained a crown-charter for the institution of a college and university; but although the charter was ratified by parliament in 1597, and renewed and enlarged by the crown in 1601, the plan was never carried out. F. has a handsome cross and town-house in the principal square, a spacious hall belonging to the Harbour Commissioners, and several recently erected public buildings.

FRASIER, a strawberry flower, is used by Scotch heraldic writers as synonymous with a cinquefoil; as in blazoning the coat of the Frasers, *Azure three frases* (Nisbet, i. p. 388).

FRATE'RCULA. See PUFFIN.

FRATICE'LLIANS, or **FRATICELLI** ('Little Brethren'), a sect of the middle ages, which may be regarded as an embodiment, outside of the medieval church, of the same spirit to which is due, within the church, the Franciscan order with its many offshoots. The Italian word *Fraticelli* originally was the popular name of the Franciscan monks; but, in the progress of the disputes which arose in the order (see FRANCISCANS), the name was specially attached to the members of the rigorist party, and eventually to those among them who pertinaciously refused to accept the pontifical explanations of the monastic rule, and, in the end, threw off all subjection to the authority of the church. Several of the popes, especially Gregory IX. and Nicholas III., attempted to reconcile the disputants. Pope Celestine V. granted permission to the rigorists to form for themselves a separate organisation, in which the rule of St Francis might be observed in all its primitive and literal rigour. The suppression of this order by Boniface VIII. appears to have furnished the direct occasion for the secession of the extreme party from the church. They openly resisted the authority of the pope, whom they proclaimed an apostate from the faith. The party thus formed was increased by adhesions from other sectarian bodies, as the 'Beghards' and the 'Brethren of the Free Spirit' (see FREE SPIRIT). In vain Clement V., in the council of Vienna (1311—1312), put forward a new declaration regarding the rule of St Francis. They still held their ground, especially in Sicily, Central and Northern Italy, and Provence. John XXII., against whom they sided actively with Lewis of Bavaria, condemned them by a special bull in 1317, and again in a similar document directed against Henry de Ceva, one of their chief leaders in Sicily. From these sources we learn that they regarded the existing church as in a state of apostasy, and claimed for their own community the exclusive title of the Church of God. They forbade oaths, and discountenanced marriage. They professed a divine mission for the restoration of the Gospel truth. They held that all spiritual authority was forfeited by sin on the part of the minister. It would even appear that they proceeded so far as to elect for themselves a pope, with a college of cardinals, and a regular hierarchy (Wadding, *Annal. Min. Fratrum ad an.* 1374, n. 20). Their principles, in a word, seem to have partaken largely of the same fanatical and anti-social tendencies which characterised the Brethren of the Free Spirit; and in common with them, the F. were the object of a rigorous persecution about the middle of the 14th century. The principles of this sect formed the subject of a public discussion at Perugia in 1374 between them and a Franciscan monk named Paolucci, which appears to have ended in their discomfiture. They still maintained themselves, nevertheless, in Central Italy, down to the 15th c., when John de Capistran received a commission to labour for their conversion in the March of Ancona; but before the beginning of the following century, they seem to have disappeared altogether. See Mosheim, *De Beghardis et Beguinabus* (Lipsiæ, 1790); Milman's *Latin Christianity*, vol. v.; Witsix's *Kirchen-Lexicon.*

FRA'TTA-MAGGIO'RE, a town of Naples, six miles north-east of the city of Naples, has extensive rope-works, and furnishes great quantities of strawberries for the market of the capital. Silk-worms are here reared in great quantities. Pop. about 9000.

FRAUD. By the laws of all civilised nations fraud invalidates obligations. In order to produce this effect, however, it is necessary that the misrepresentations, or other dishonest manœuvres of the offending party, shall have induced the other to enter into the agreement or contract, and that he would not otherwise have consented. Fraud of this description on the one side produces *error in essentialibus* on the other, and where such error exists there is no consent. But as consent is of the essence of the contract, there is here no contract at all; i. e., the contract, or pretended contract, is, as lawyers say, null *ab initio.* It is not necessary that the fraud which thus gives birth to the contract shall have consisted in positive misrepresentation, or even in studied concealment; and it was well laid down in the case of an English sale, that where the purchaser laboured under a deception, in which the seller permitted him to remain, on a point which he knew to be material in enabling him to form his judgment, the contract was void. But there is another kind of fraud which, though it be not actually the cause of, is incident to, the contract, and which, though it does not annul the contract, gives rise to an action for damages or restitution by the party deceived. The distinction between these two kinds of fraud was well known to the civilians, the first species being described by them as that 'quod causam dedit contractui,' that is to say, which causes the contract; the second as that 'quod tantum in contractum incidit,' which is incident to, or accompanies the contract, but independently of which the contract would have been entered into (Voet. lib. 4, tit. 3, 3). There is another very important element to be taken into account in judging of the character, and determining the legal effects of a fraud, viz., whether it proceeded from one whose position was such as to impose upon him the obligation of making the discovery. In illustration of this principle, the following case was put by Lord Thurlow in Fox *v.* Mackreth (2 Bro. Ch. R. 420): 'Suppose that A, knowing there to be a mine on the estate of B, of which he knew B was ignorant, should enter into a contract to purchase the estate of B for the price of the estate, without considering the mine, could the court set it aside? Why not, since B was not apprised of the mine, and A was? Because A, as the buyer, was not obliged, from the nature of the contract, to make the discovery. . . . . The court will not correct a contract merely because a man of nice honour would not have entered into it; it must fall within some definition of fraud. The rule must be drawn so as not to affect the general transactions of mankind.' Neither will the commendations usually bestowed on their commodities by tradesmen be regarded as fraudulent statements, so long as they are simply extravagant in degree; but if positively at variance with facts known to them, they will not be permitted to enjoy the protection which custom has extended to ordinary 'puffing.' The same principle will yield the converse result wherever a relation of peculiar confidentiality exists between the contracting parties. Here courts of law require what is called *uberrima fides*, the fullest measure of good faith, to validate the transaction. As an illustration, may be mentioned a case in which the managing partner of a firm purchased the share of his co-partner for a sum which he knew from the accounts, of which he had the entire superintendence, to be inadequate, but the inadequacy of which he concealed. The transaction was reduced, Sir John Leach, V. C., remarking that 'the defendant being the partner whose business it was to keep the accounts of the concern, could not, in fairness, deal with the plaintiff for his share of the profits of the concern without putting him in possession of all the information which he himself had with respect to the state of the accounts between them.'—Maddeford *v.* Austwick 1 Gim. R. 89.

In addition to direct misrepresentation, and concealment in circumstances in which open dealing was a duty, fraud may be perpetrated by taking advantage of the imbecility of the party who has been led into the contract, and still more flagrantly by inducing this imbecility by intoxication or otherwise. See CONCEALMENT, ERROR, MISREPRESENTATION, CONTRACT, SALE-WARRANTY. In addition to the ordinary English sources of information, we may refer to the extensive and learned *Traité du Dol et de la Fraude*, par J. Bédarride, 3 vols. (Paris, 1852).

FRAUNHOFER, JOSEPH VON, a distinguished practical optician, was born at Straubing, in Bavaria, 6th March 1787. In 1799 he was apprenticed to a glass-cutter in Munich, and in 1806 was received, as a working optician, into the establishment of Reichenbach and Utschneider at Benedictbeurn (afterwards, in 1819, removed to Munich). While there, he acquired considerable wealth through his inventions, and soon afterwards became proprietor of the establishment. He invented a machine for polishing parabolic surfaces, and was the first who succeeded in polishing lenses and mirrors without altering their curvature. His prisms also were celebrated, being free from the blebs and striæ which are so often seen in those of English manufacture. His inventions are numerous, and include a 'heliometer,' a 'micrometer,' an 'achromatic microscope,' besides the great parallactic telescope at Dorpat. But that which has rendered F.'s name celebrated throughout the scientific world, is his discovery of the lines in the Spectrum. He died at Munich on the 7th of June 1826.

FRAU'NHOFER'S LINES. See SPECTRUM.

FRAU'STADT (Polish, Wszowa), a town of Prussia, in the government of Posen, is situated in a sandy plain on the Silesian frontier, 55 miles north-west of Breslau. It has linen, woollen, and other manufactures, and important grain markets. In the vicinity are about 100 wind-mills. Pop. 6724.

FRAXINE'LLA. See DITTANY.

FRA'XINUS. See ASH.

FREDERI'CIA, a seaport and fortress of Denmark, is situated on the east coast of the province of Jutland, on a projecting tongue of land, at the northern entrance to the Little Belt. It is fortified with nine bastions and three ravelins on the land-side, and with two bastions towards the sea. It has several ecclesiastical edifices, a hospital, and a custom-house, at which a toll is paid by all ships passing through the Little Belt. Tobacco is grown and manufactured here. Pop. 5579.

FRE'DERICK (Ger. **FRIEDRICH**) **I.**, of Germany.—Frederick I., Emperor of Germany, surnamed Barbarossa (Redbeard), was born in 1121, succeeded his father, Frederick Hohenstaufen, as Duke of Swabia in 1147, and his uncle, Conrad III., as emperor in 1152. He was one of the most enlightened and powerful rulers who ever swayed the imperial sceptre. In his desire to emulate Charlemagne, and to raise the secular power of the empire in opposition to the arrogated supremacy of the papal chair, he was brought into constant collision with his Italian subjects. Six times he was compelled to cross the Alps at the head of great armies, in order to chastise the refractory cities of Lombardy, which were ever ready, on the slightest provocation, to throw off their allegiance. In the early periods of his reign, he visited their defection with undue severity; but in his latter days his conduct towards them was characterised by a generous leniency and a politic liberality in advance of his age; and in 1183, he convoked a council at Constance, in which he finally agreed to leave the Lombard cities the right to choose their own municipal rulers, and to conclude treaties and leagues among themselves, although he retained his supremacy over them, together with the power of imposing certain fixed taxes. The difficulty of settling the Italian differences was as usual aggravated in F.'s time by the attitude assumed by the occupants of the papal chair, and at one time Italy was distracted by the pretensions of two rival popes, Alexander III. and Victor IV., who each excommunicated the other, and hurled the anathemas of the church against their several opponents; and it was not till 1176 that F., after his defeat at Lignano, by consenting to acknowledge Urban II., the successor of Alexander III., as the rightful pope, was enabled to turn his attention to Germany. By his energetic measures, he succeeded in thoroughly humbling his troublesome vassal, Henry the Lion, Duke of Brunswick, and thus crushing the Guelfic power in Germany. F. made Poland tributary to the empire, raised Bohemia to the rank of a kingdom, and the markgrafdom of Austria into an independent hereditary duchy. In 1189, F., having settled the affairs of the empire, and proclaimed universal peace in his dominions, resigned the government to his eldest son Henry, and, at the head of 100,000 men, set forth for the Holy Land, accompanied by his second son, Frederick of Swabia, the founder of the order of Teutonic Knights. After gaining two great victories over the Saracens at Philomelium and Iconium, he was drowned (1190) in a river of Syria, while trying to urge his horse across the stream. His remains were rescued by his son, and buried at Tyre. The death of F., which led to the dispersion of the Crusaders before any material advantage had been obtained over the Infidels, excited the deepest grief in Germany, where his memory has always been cherished as that of the best and wisest of his race. F. was a patron of learning, and enacted many admirable laws, some of which are still in force.

FREDERICK II., of Germany, grandson of the former, and son of the Emperor Henry VI., and of Constance, heiress of Sicily, was born in 1194. His mother secured the favour of Pope Innocent III. for her infant son, by conceding many important privileges to the papal chair; and after the civil war which had raged in Germany for eight years between the rival claimants of the throne, Philip of Swabia and Otho IV., was brought to an end by the agency of Innocent, F. succeeded (1212) in obtaining the support of the German electors. On his promising to undertake a crusade, the pope sanctioned his coronation at Aix-la-Chapelle in 1215. Like his grandfather, F. was actuated by an ardent desire for the consolidation of the imperial power in Italy at the expense of the pontificate, which he wished to reduce to the rank of a mere archiepiscopal dignity. Having secured the nomination of his son Henry to the rank of king of the Romans, and appointed Archbishop Engelbert of Cologne as his vicegerent, he left Germany; and after having been crowned emperor at Rome in 1220, devoted himself to the task of organising his Italian territories. He founded the university of Naples, gave encouragement to the medical school of Salerno, invited to his court and patronised men of learning, poets, and artists, and commissioned his chancellor, Petrus de Vineis, to draw up a code of laws, to suit all classes of his German and Italian subjects. F.'s schemes for the union of his vast and widely scattered dominions were, however, frustrated by the refractory conduct of the Lombard cities, and still more by the arrogance of the popes Honorius III. and Gregory IX., who threatened him with excommunication unless he fulfilled his pledge of leading a crusade. Being compelled to depart on this expedition, he made the necessary preparations for its prosecution; but a pestilence having broken out among his troops in the Morea, he returned in haste to Italy, only to be again forced away by papal threats. This second attempted crusade proved more successful; and in 1228, notwithstanding the machinations of the pope, and the treachery of the Knights Templars, F. extorted a ten years' truce from the Moslem ruler, and forced him to give up Jerusalem and the territory around Joppa and Nazareth. The rest of his life was spent in bringing his rebellious Lombard subjects to subjection, and in counteracting the intrigues of the pope, the rebellion of his eldest son, and the treachery of his friend and minister, the Chancellor Petrus de Vineis, who was suspected of attempting to poison him. F., who died suddenly in 1251, the possessor of seven crowns, was the most accomplished sovereign of the middle ages, for he not only spoke and wrote the six languages common to his subjects, but he was famed for his talents as a minnesinger, and for his skill in all knightly exercises, while he wrote elaborate treatises on natural history and philosophy. His strong sympathies with his Italian mother-land, and his unremitting endeavours to establish a compact and all-supreme empire in Italy, were the causes, not only of his own misfortunes, but of the miseries which he brought upon the German empire, by embroiling him in costly wars abroad, and leading him to neglect the welfare, and sacrifice the interests of his German subjects. See for Frederick I. and Frederick II., Raumer, *Geschichte der Hohenstauffen;* Sismondi, *Italian Republics*, and *Europe in the Middle Ages;* Voigt's *Lombardenbund;* Funk, *Geschichte Kaiser Friedrich II.*

FREDERICK III., of Germany.—Frederick who was F. III. as Emperor of Germany, F. IV. as King of Germany, and F. V. as Duke of Austria, was born in 1415, being the son of Duke Ernst, of the Styrian branch of the house of Hapsburg. At the age of 20, he undertook an expedition to the Holy Land; and on his return, in conjunction with his factious brother, Albert the Prodigal, he assumed the government of his hereditary dominions of the Duchy of Austria, the revenues of which scarcely exceeded 16,000 marks. On the death of the Emperor Albert II., he was unanimously elected as his successor; and two years afterwards, in 1442, he was solemnly crowned at Aix-la-Chapelle; ten years later, he received the imperial crown at the hands of the pope at Rome, and in 1453 secured the archducal title to his family. His reign was a prolonged struggle against domestic intrigues and foreign aggressions. One of his most troublesome opponents was his brother Albert, who refused to give up the provinces which he held until he had received a large sum of money; but notwithstanding these causes of annoyance, and while John Hunyades Corvinus, at the head of a Hungarian army, overran Austria, and laid siege to Vienna, and the usurper Sforza possessed himself of the imperial fief of Milan, on the extinction of the male line of the Visconti, F. remained absorbed in his own private studies, or roused himself only to attempt, by the aid of foreign mercenaries, to recover the crown-lands of which the House of Austria had been deprived. His pusillanimous subserviency to the papal chair, and his wavering policy, irritated the electors, who at one time cherished the design of deposing him and nominating George Podiebrand, king of Bohemia, to the imperial throne; while it entangled him in quarrels on account of the succession to the Palatinate, and other questions of German policy, and deprived the church in Germany of that independence from the thraldom of the papal chair which it had been the object of the Council of Basel to secure to it. The contempt in which F. was held was made apparent on the death of his ward, Ladislaus, king of Hungary and Bohemia, without children, when, notwithstanding his just pretensions to this inheritance, he was passed over, the people of the former having chosen George Podiebrand as their king, and those of the latter Matthias Corvinus. His brother Albert's death in 1463 secured him a short reprieve from internal disturbances, and gave him possession of Upper Austria; but he was repeatedly embroiled in quarrels with Podiebrand and Matthias; the latter of whom several times besieged Vienna, and finally dispossessed him of every town of importance in his hereditary domains. In the meanwhile, the Turks were suffered to push their conquests in Europe until they had advanced in 1456 to Hungary, in 1469 to Carniola, and in 1475 to Salzburg, although a vigorous opposition at the outset would easily have put a definite stop to their encroachments. On the death of Matthias, in 1490, F. recovered Austria, but he was obliged to acknowledge Prince Ladislaus of Bohemia as king of Hungary. This mortification was soon followed by his death, in 1493, after an inglorious reign of 53 years, which did nothing to advance the prosperity or progress of the empire, although the times were propitious to both. But although F. neglected the interests and duties of the imperial crown to indulge in the pursuit of his favourite studies in alchemy, astronomy, and botany, he never lost an opportunity of promoting the aggrandisement of his own family, which he very materially secured by marrying his son and successor, Maximilian, to Mary, the rich heiress of Charles the Bold of Burgundy. F. was temperate, devout, parsimonious, scrupulous about trifles, simple in his habits, pacific in his disposition, and naturally averse to exertion or excitement. From his time, the imperial dignity continued almost hereditary in the House of Austria, which has perpetuated the use of his favourite device, A. E. I. O. U., *Austriæ Est Imperare Orbi Universo.* See Æneas Sylvius, *Historia;* Coxe, *House of Austria.*

FREDERICK V., Prince Palatine.—Frederick V., Electoral Prince Palatine, was born in 1596, succeeded to the Palatinate in 1610, was king of Bohemia from 1619 to 1620, and died in 1632. He married, in 1613, Elizabeth, the daughter of James VI. of Scotland and I. of England, through whose ambitious counsels he was induced to take a prominent part in the proceedings of the union of the Protestant princes of Germany, and finally, although against his own inclinations, to accept the title of king of Bohemia. His complete defeat at the battle of Prague terminated his short-lived enjoyment of the regal crown, of which he retained no other memorial but the mocking title of 'The Winter King.' Ridicule and contumely followed him wherever he went, and the rest of his life was spent in exile under the ban of the empire, and with no resources beyond those which he could obtain from the generosity of his friends. In 1623, he was declared to have forfeited his electoral title and his dominions in the Palatinate, which were conferred upon his cousin, Maximilian of Bavaria, the head of the Catholic league.

FREDERICK I., of Denmark, was born in 1473, and died in 1533. During the disturbed reign of his nephew, Christian II., he behaved with so much circumspection, that the choice of the nation fell upon him when the king was deposed, and he was raised to the throne in 1523. He shewed great cruelty to his unfortunate relative, whom he detained in close captivity; but he was a politic ruler. In 1527 he embraced the Lutheran faith, which he established in his dominions by the most arbitrary measures.

FREDERICK III., of Denmark, the son of Christian IV., was born in 1609, succeeded to the throne in 1648, and died in 1670. The wars of his father's reign had brought the country to a state of great embarrassment; and notwithstanding all his efforts to maintain peace, F. was continually embroiled in the quarrels of other nations, and during his reign Copenhagen was twice besieged by the Swedes under their warlike king, Charles Gustavus; nor was peace re-established till after the death of Charles. The reign of F. III. was rendered memorable by the change effected in the constitution, which, after having been in some degree elective, was at once changed into a hereditary and absolute monarchy by the voluntary act of the commons and clergy, who, from abhorrence of the nobility, surrendered to the crown the liberties and prerogative which they had hitherto enjoyed, and made the sovereign absolute and irresponsible.

FREDERICK V., of Denmark, the son and successor of Christian VI., was born in 1723, ascended the throne in 1746, and died in 1766, leaving the reputation of having been one of the best and wisest monarchs of his time. Denmark owed to him the increase of her national wealth, and the establishment of various branches of commerce and manufacture. F. established a Greenland Company, opened the American colonial trade to all his subjects, founded the military academy of Soroe, in Denmark, and caused schools to be opened at Bergen and Trondhjem, in Norway, for the instruction of the Laplanders. He established academies of painting and sculpture at Copenhagen, and sent a number of learned men—among whom was Niebuhr, the father of the historian—to travel and make explorations in the East.

FREDERICK VI., of Denmark, the son of Christian VII. and Caroline Matilda of England, was born in 1768, and assumed the regency of the kingdom in 1784, on account of the insanity of his father, on whose death, in 1808, he ascended the throne. In this reign, feudal serfdom was abolished, monopolies abrogated, the criminal code amended, and the slave-trade prohibited earlier than in any other country. In 1800, Denmark joined the maritime confederation formed between Russia, Sweden, and Prussia, which led to retaliation on the part of England, to the seizure by that power of all Danish vessels in British ports, and to the despatch of a powerful fleet, under Sir Hyde Parker and Nelson, to give efficacy to the peremptory demand that the regent should withdraw from the convention. His refusal to accede to this demand was followed by a fierce naval engagement, in which the Danish fleet was almost wholly destroyed. A peace was concluded on the regent's withdrawal from the confederation; but in consequence of his persisting to maintain an attitude of neutrality, instead of combining with Great Britain against Napoleon, the war was renewed in 1807 by the appearance, before Copenhagen, of a British fleet, bearing envoys, who summoned F. to enter into an alliance with England, and to surrender his fleet and arsenals, and the castle of Cronborg, commanding the Sound. On his refusal, Copenhagen was bombarded for three days, the arsenals and docks destroyed, and all the shipping disabled, sunk, or carried to England. This blow paralysed the national resources, and it required the exercise of much discretion on the part of the government, and great endurance on that of the people, to prevent the irremediable ruin of the country. Smarting under the treatment which he had experienced from the English, the Danish monarch became the ally of Napoleon, and suffered proportionally after the overthrow of his empire. In 1814, Norway was taken by the allies from Denmark, and given to Sweden. The state became bankrupt, and many years passed before order could be restored to the finances. Notwithstanding his autocratic tendencies, F. so far yielded to the movements of the times as to give his subjects, in 1831, a representative council and a liberal constitution. He died December 3, 1839.

FREDERICK VII., of Denmark, the reigning king of Denmark, was born in 1808, and succeeded his father, Christian VIII., in 1848. The principal events of his reign have been the wars and diplomatic negotiations arising out of the revolt of the duchies of Holstein and Slesvig (q. v.), and the vexed question of the succession to Denmark Proper and the duchies on the death of the king and of his uncle, the heir-presumptive, both of whom are childless. Notwithstanding the heavy expenses of the war, the finances have been considerably augmented, and the material prosperity of the country has increased during the present reign.

FREDERICK-WILLIAM, Duke of Brunswick, born in 1771, entered the Prussian service at an early age, and was actively engaged with the army during the war with France in 1792, and again in 1806, and was taken prisoner with Blücher at Leipsic. On the death of his father and eldest brother, he would have succeeded to the dukedom, as his other brothers were incapacitated by disease for reigning, had not Napoleon put a veto on his accession to power. Being resolved to take part in the war against the French, he raised a free corps in Bohemia, and threw himself into Saxony, which he was, however, speedily compelled to evacuate. After the total defeat of the Austrians in 1809, the duke determined to leave Germany; and with his corps of 700 'black hussars,' and 800 infantry, he began his masterly retreat. After various skirmishes, in one of which he defeated the Westphalian commander Wellingerode and a picked detachment of troops, he reached Brunswick, in the neighbourhood of which he gained a victory at Oelper over 4000 Westphalians, commanded by General Reupel. He next crossed the Weser, and having reached Elsfleth, and taken possession of a sufficient number of vessels and seamen, he embarked his troops; and finally, after stopping at Heligoland, landed in England with his men in August 1809. He was received with enthusiasm; and having entered the English service with his men, subsequently took part in the Peninsular war, where he served with distinction, receiving from the British government an allowance of £6000 a year, which he retained till his return to his own dominions in 1813. Although no prince could be more earnestly bent on securing the welfare of his subjects, his efforts failed utterly from the untimely and injudicious nature of the reforms he endeavoured to effect; while the magnitude of his military establishments, which were quite unsuited to the limited extent of his territories, excited the ill-will of his people. He joined the allied army with his hussars after the return of Napoleon from Elba, and fell gloriously while leading on his men at Quatre Bras, on the 16th of June 1815.

FREDERICK-WILLIAM, Elector of Brandenburg, commonly called 'the Great Elector,' was born in 1620, succeeded to the electorate in 1640, and died in 1688. On his accession, he found an empty exchequer, the towns and cities depopulated, and the whole electorate devastated by the ravages of the Swedish and Imperialist armies during the Thirty Years' War, which was not yet concluded; while a portion of his inheritance had even been confiscated by the Swedes. His first acts were to regulate the finances, and to conclude a treaty of neutrality with Sweden, which left him at leisure to devote himself to the organisation of his army, and the re-peopling of the deserted towns and villages by means of immigration. By the treaty of Westphalia, through which he lost several important places, he recovered the eastern portions of Pomerania, Hohenstein, the bishoprics of Halberstadt, Minden, and Kamin, as lay-principalities, and the reversion of the archbishopric of Magdeburg. In the course of ten years he had, by the help of his generals, Derfflinger, Schomberg, and Kannenberg, created an army of 25,000 men, organised on the Swedish model; and having been constrained to enter into an alliance with Charles X., he co-operated with him in the taking of Warsaw, which was effected at the cost of a most sanguinary engagement in 1656. In return for this co-operation, F.-W. secured the emancipation of his Prussian duchy from its former dependence on Poland. The aggressions of Louis XIV. on the Rhenish frontier alarmed the elector, who induced the emperor, the king of Denmark, and the Elector of Hesse-Cassel, to enter into a league against France. The result was unfavourable to the cause of the German princes, and F.-W. was obliged to content himself with making highly disadvantageous terms. The war was soon renewed, and Brandenburg was again a prey to the incursions of the Swedes, who, at the instigation of Louis, advanced upon Berlin, laying waste everything on their march. The elector, who had taken up his winter-quarters in Franconia, hurried across the Elbe at the head of his cavalry, and having signally defeated the Swedes, drove them from his dominions. If the emperor had been true to his word, and supported him, F.-W. might have made head against the French; but being forsaken by the other German princes, and his dominions overrun by the troops of Louis, he was obliged to agree to the treaty of St Germain, by which he restored all his conquests to the Swedes, in return for the withdrawal of the French army, and the payment to him of an indemnity of 300,000 crowns. From this time forth, F.-W. devoted himself to the task of consolidating the prosperity of his dominions.

During his reign, he more than tripled the area of his territories, and by his generous reception of 20,000 French Protestants after the revocation of the Edict of Nantes, and the encouragement which he afforded to the immigration of Dutchmen and other foreigners, he augmented the population of his states, and introduced numerous industrial arts among his subjects. He founded the university at Duisburg, and the royal library at Berlin, and reorganised the universities of Frankfurt-on-the-Oder, and Königsberg, opened canals, established a system of posts, and greatly enlarged and beautified Berlin. He left a well-filled exchequer and a highly organised army. See Orlich, *Gesch. des Preuss. Staats im 17 Jahrh.* Berl. 1839.

FREDERICK III., Elector of Brandenburg, son and successor of the former, and the first king of Prussia, was born in 1657, and succeeded to the electorate of Brandenburg in 1688. He exhibited the same zeal as his father for the aggrandisement and amelioration of his dominions; but he was distinguished from him by his admiration of Louis XIV., whose pomp and luxurious display he imitated at his own court. He supported William of Orange in his attempt on England, and gave him a subsidy of 6000 men, which, under the command of Marshal Schomberg, contributed to gain the victory at the Boyne which decided the fate of James II. F. was always ready to lend troops and money to his allies; he sent 6000 of his best men to aid the Imperialists against the Turks; and although he met with the same ingratitude as his father, he succeeded, by treaties, exchanges, and purchases, in very considerably extending his territories; and after many years' negotiations, he induced the emperor to agree to the 'Crown Treaty,' by which, in return for permission to assume the title of King of Prussia, he bound himself to furnish certain contingents of men and money to the Imperial government. As soon as this treaty had been signed, F. hastened in mid-winter with all his family and court to Königsberg, where, on the 18th January 1701, he placed the crown on his own head. He died February 25, 1713. F. did much to embellish Berlin, where he founded the Royal Academy of Sciences, and the Academy of Painting and Sculpture, erected several churches, and laid out numerous streets. He established a court of appeal at Berlin, built the palace of Charlottenburg, and founded the university at Halle; but his actions were generally influenced by a love of display; and his vanity, together with his neglect of those who had served him, made him personally unpopular, although his patriotic love of Germany redeemed, in the eyes of his countrymen, many of his bad points.

FREDERICK-WILLIAM I., of Prussia, born in 1688, was in almost every particular the opposite of his father Frederick I. He was simple, and almost penurious in his habits, attentive to business, passionately fond of military exercises, but averse to mental cultivation, and fond of the society of the low and illiterate, while he carried to the utmost his ideas of arbitrary power and the divine right of kings. The public events of his reign were of little importance, although he was continually implicated in foreign wars, and he supported the cause of Stanislaus of Poland, and assisted Austria in her contests with France. He died in 1740. By his economy and reforms in the finances, he was able to indulge his taste for the organisation of military forces, while his childish love of tall soldiers induced him to connive at the most flagrant outrages both at home and abroad for kidnapping tall men and forcing them into his service: the result of this system was, that he left at his death a well-drilled army of 70,000 soldiers, of whom a large proportion were men of gigantic stature. What was of more consequence to his son and successor was, that his exchequer contained 9,000,000 thalers, and that his kingdom had attained an area of more than 45,000 square miles, and a population of upwards of 2,240,000. See Morgenstern, *Ueber Friedrich Wilhelm I.* (Braunsch. 1793); F. Förster, *Gesch. Friedrich-Wilhelm's I.* (Pots. 1835); Carlyle, *Hist. of Friedrich II., called Frederick the Great.*

FREDERICK II., of Prussia, surnamed 'the Great,' was the son of Frederick-William I. and the Princess Sophia-Dorothea, daughter of George I. of Great Britain, and was born in 1712. His early years were spent under the restraints of an irksome military training, and a rigid system of education. His impatience under this discipline, his taste for music and French literature, and his devotion to his mother, gave rise to dissensions between father and son, and resulted in an attempt on the part of F. to escape to the court of his uncle, George II. of England. Being seized in the act, his conduct was visited with still greater severity, and he himself was kept in close confinement, while his friend and confidant, Lieutenant Katt, was executed in his sight, after having been barbarously ill-treated by the king. According to some reports, the prince's life would have been sacrificed to the fury of his father, had not the kings of Sweden and Poland interceded in his favour. Having humbly sued for pardon, he was liberated, and allowed to retire to Ruppin, which, with the town of Rheinsberg, was bestowed upon him in 1734. Here he continued to reside till the king's death, surrounded by men of learning, and in correspondence with Voltaire, whom he especially admired, and other philosophers; but on his accession to the throne in 1740, he laid aside these peaceful pursuits, and at once gave evidence of his talents as a legislator, and his determination to take an active share in the political and warlike movements of the age. His first military exploit was to gain a victory at Mollwitz over the Austrians, in 1741, which nearly decided the fate of Silesia, and secured to Prussia the alliance of France and Bohemia. Another victory over the Empress Maria Theresa's troops made him master of Upper and Lower Silesia, and closed the first Silesian war. The second Silesian war, which ended in 1745, from which F. retired with augmented territories and the reputation of being one of the first commanders of the age, was followed by a peace of eleven years, which he devoted to the improvement of the various departments of government, and of the nation generally, to the organisation of his army, and the indulgence of his literary tastes. The third Silesian war, or 'the Seven Years' War,' was begun in 1756 by the invasion of Saxony—a step to which F. was driven by the fear that he was to be deprived of Silesia by the allied confederation of France, Austria, Saxony, and Russia. This contest, which was one of the most remarkable of modern times, secured to F. a decided influence in the affairs of Europe generally, as the natural result of the pre-eminent genius which he had shewn both under defeat and victory; but although this war crippled the powers of all engaged in it, it left the balance of European politics unchanged. It required all the skill and inventive genius of F. to repair the evils which his country had suffered by the war. In 1772, he shared in the partition of Poland, and obtained as his portion all Polish Prussia and a part of Great Poland; and by the treaty of Teschen, in 1779, Austria was obliged to consent to the union of the Franconian provinces with Prussia, and he was thus enabled to leave to his nephew and successor a powerful and well-organised kingdom, one-half larger in area than it had been at his own accession, with a full treasury, and an army of 200,000 men. He died at the château of Sans Souci, August 17, 1786. Frederick the Great is said to have 'inherited all his father's excellences and none of his defects.' His courage, fertility of resource, and indomitable resolution, cannot be too highly praised. Not the least wonderful of his achievements was his contriving to carry on his bloody campaigns without incurring a penny of debt. A true spirit of self-sacrifice—though not, perhaps, for the highest ends—was in him. Never was king more liberal towards his subjects. In Silesia, where war had nearly ruined the inhabitants, he once remitted the taxes for six months, and in Pomerania and New Brandenburg for two years, while his government was carried on with rigid economy, such as Europe had never before witnessed. But not only was his government economical, it was essentially just. Religious persecution was unknown, civil order everywhere prevailed; property was secure, and the press was free. On the other hand, F.'s faults were far from being few. Education had made him French in all his ideas and prejudices; and in those days, to be French was to be sceptical. He was utterly unconscious of the grand intellectual and spiritual life that was about to spring up in Germany, and to make it again the guiding-star of Europe, as it had been in the days of Luther. He was, in fact, almost ignorant of his native language, which, moreover, he despised as semi-barbaric; though before his death Goethe had published his *Götz von Berlichingen*, *Sorrows of Werther*, *Iphigenia in Tauris*, and many of his finest lyrics; while Kant, besides a variety of lesser works, had also given to the world his master-piece, the *Critique of Pure Reason*. The new literature was essentially one of belief and aspiration, and therefore alien to the tendencies of the royal disciple of Voltaire, who had learned from his master to cherish at once contempt and suspicion of his fellow-creatures. This disagreeable feature of his character increased with years. He declared the citizen class to be destitute alike of ability and honour, and relied not on the love of the nation, but on his army and purse. F. was a very voluminous writer. Of his numerous works, all of which are written in French, his *Mémoires pour servir à l'Histoire de Brandenbourg*, and *Histoire de la Guerre de Sept Ans*, exhibit perhaps the greatest powers of description, but all evince talent of no common order. The Academy of Berlin, by the direction of Frederick-William IV., brought out a fine edition of his collected works in octavo and quarto, 1846—1851. Frederick left no children, and was succeeded by his nephew, Frederick-William II. See Carlyle, *History of Frederick II.*; Pagenel, *Histoire de F. le Grand* (Par. 1830); Riedel, *Gesch. d. Preussisch. Königsh.* (Berl. 1861).

FREDERICK-WILLIAM II., of Prussia, was born in 1744, and died in 1797. After a prolonged estrangement between his uncle and himself, he regained the good-will of the king by his valour in the war of the Bavarian succession in 1778; but although he succeeded to a well-consolidated power and an overflowing treasury, he had not the capacity to maintain his favourable position. Futile or hastily undertaken wars wasted his resources; so that at his death, instead of the overplus of 70,000,000 thalers that had been bequeathed to him, the state was hampered with a debt of 22,000,000. His predilection for unworthy favourites, the establishment of a strict censorship of the press, and the introduction of stringent ecclesiastic enactments, alienated the affections of the people from him, although his natural mildness of disposition had excited the sanguine hopes of the nation on his accession. F.-W. shared in the second partition of Poland in 1793, and thus gained a considerable addition to his kingdom, which, by purchase, inheritance, and other means, was augmented during his reign by the acquisition of more than 46,000 square miles of territory, and 2½ millions of inhabitants. The chief internal improvements in this reign were the introduction of a new code of laws, and a less onerous mode of raising the taxes.

FREDERICK-WILLIAM III., of Prussia, the son of Frederick-William II., was born in 1770. He early took part in the administration, and, on his accession in 1797, he at once dismissed the unworthy favourites of the preceding reign, and accompanied by his beautiful young queen, Louisa of Mecklenburg-Strelitz, made a tour of inspection through the numerous provinces of his kingdom, with a view of investigating their condition, and contributing to their local and general improvement. But although F.-W. was well intentioned, and in his moral and domestic relations his conduct was exemplary, he lacked the dignity and force of will to cope with the difficulties of his position. By his efforts to maintain an attitude of neutrality in the great European struggle that had been excited by the wars and victories of the French, he awakened the distrust of all the great anti-Gallican powers of Europe, and disappointed the petty German princes, who had looked upon Prussia as their protectress against foreign encroachments. Napoleon's promises of support and friendly intentions soon changed this neutrality to an alliance with France, and for some time Prussia persevered in her dishonourable and self-seeking policy, which was rewarded by the acquisition of Hildesheim, Paderborn, and Münster, which added nearly 4000 square miles of territory, and half a million of inhabitants to the kingdom; but at length the repeated and systematic insults of Napoleon, who despised F.-W. while he professed to treat him as a friend, roused the spirit of the nation, and the king saw himself obliged, in 1805, to agree to a convention with Russia, the real object of which was to drive Napoleon out of Germany. Again the treachery of Prussia led her to make a new treaty with France, by which she consented to receive the electorate of Hanover, and thus involved herself in a war with England. The insults of Napoleon were redoubled after this fresh proof of F.-W.'s indecision. The Prussian nation, headed by the queen, now called loudly for war, and at the close of 1806, the king yielded to these appeals. Hostilities began without further delay; but the defeat of the Prussians at Jena, Eylau, and Friedland, compelled their unfortunate monarch to sue for peace. The Prussian army was annihilated, and the whole of the kingdom, with the exception of a few fortified places, remained in the power of the French. By the intervention of the Emperor Alexander of Russia, a peace was concluded, known as the Treaty of Tilsit, by which F.-W. lost the greater part of his realm, and was deprived of all but the semblance of royalty; but although for the next five years he was a mere tool in the hands of Napoleon, who seized every opportunity of humbling and irritating him, his spirit was not subdued, and his unremitting efforts at this period of his life to reorganise his enfeebled government by self-sacrifices of every kind, endeared him greatly to his people. The disastrous termination of Napoleon's Russian campaign was the turning-point in the fortunes of Prussia; for although the French emperor was victorious over the Prussians and Russians in the battles of Lützen and Bautzen, which were fought soon after the declaration of war which F.-W. had made against France, to the great joy of his people, in 1813, the allies were soon able to renew hostilities, which were carried on with signal success, until they finally culminated in the great battle of Leipsic, in which the Prussians, under their general, Blücher, earned the greatest share of glory. The Peace of Vienna restored to Prussia almost all her former possessions, while the part taken by the Prussian army under Blücher in gaining the victory of Waterloo, by which Napoleon's power was finally broken, raised the kingdom from its abasement. From that time, F.-W. devoted himself to the improvement of his exhausted states; but although before the French revolution of 1830 Prussia had recovered her old position in regard to material prosperity at home and political consideration abroad, the king adhered too strictly to the old German ideas of absolutism, to grant his people more than the smallest possible amount of political liberty. He had indeed promised to establish a representative constitution for the whole kingdom, but this promise he wholly repudiated when reminded of it, and merely established the *Landstände*, or Provincial Estates, a local institution, devoid of all effective power. His support of the Russian government in its sanguinary methods of crushing revolutionary tendencies in Poland, shewed his absolute tendencies, and his dread of liberal principles. F.-W. was more than once embroiled with the pope, on account of his violation of the concordat. He concluded the great German commercial league known as the *Zollverein* (see GERMANY), which organised the German customs and duties in accordance with one uniform system. He died in 1840.

FREDERICK-WILLIAM IV., OF PRUSSIA, son of the foregoing, was born October 15, 1795. He had been carefully educated, was fond of the society of learned men, and was a liberal patron of art and literature. He exhibited much of his father's vacillation and instability of purpose; and although he began his reign (June 7, 1840) by granting minor reforms, and promising radical changes of a liberal character, he always, on one plea or other, evaded the fulfilment of these pledges. He was possessed by high but vague ideas of 'the Christian state,' and shewed through life a strong tendency to mystic pietism. The one idea to which he adhered with constancy was that of a union of all Germany into one great body, of which he offered himself to be the guide and head. He encouraged the duchies of Holstein and Slesvig in their insurrectionary movement, and sent troops to assist them against Denmark; but he soon abandoned their cause, and being displeased with the revolutionary character of the Frankfurt Diet, refused to accept the imperial crown which it offered him. The conspiracies in Prussian Poland were suppressed with much rigour; and the popular movement which followed the French revolution of 1848, was at first met by the king with resolute opposition; but when the people persisted in demanding the removal of the troops from the capital, and enforced their demand by storming the arsenal, and seizing on the palace of the Prince of Prussia (the present king), who was at that time especially obnoxious to the liberals, he was obliged to comply with their wishes. Constituent assemblies were convoked, only to be dissolved when the king recovered his former security of power, and new constitutions were framed and sworn to, and finally modified or withdrawn. After the complete termination of the revolution in Germany, the revolutionary members of the Assembly of 1848 were prosecuted and treated with severity, the obnoxious 'pietistic' party and the nobility were reinstated in their former influence at court, and the freedom of the press and of religious and political opinion, was strictly circumscribed. The life of the king was twice attempted; first in 1847 by a dismissed burgomaster, named Tschech; and secondly, in 1850, by an insane discharged soldier of the name of Sefeloge. In 1857, F.-W. was seized with remittent attacks of insanity; and in 1858 he resigned the management of public affairs to his brother and next heir, who acted as regent of the kingdom till his own accession, in 1860, as William I. F.-W. died in 1861.

FRE'DERICTON, the political capital of New Brunswick, in British North America, stands on the right bank of the St John, the largest river in the province. It is 56 miles to the north-west of the principal seaport, which bears the name of the stream above mentioned, and it is itself accessible to vessels of 50 tons. The population is about 6000. In addition to the public buildings, which F. possesses as the seat of government, it contains the university of King's College, which, independently of other resources, receives from the legislature an annual grant of £2000.

FRE'DERIKSHALD, a fortified seaport of Norway, in the department (amt) of Smalenen, stands on an inlet called Swinesund, near the Swedish border, about 60 miles south-south-east of Christiania. It is beautifully situated, and is a neat, well-built town, with several handsome edifices. Its harbour is excellent; in it the largest vessels may be safely moored. F. largely exports deals and lobsters. Pop. 7408. To the south-east of the town stands the fortress of Frederiksteen, on a perpendicular rock 400 feet high. This fortress, though often assaulted, has never yet been taken. While laying siege to Frederiksteen, Charles XII. of Sweden was killed, 1718; in commemoration of which event an obelisk was raised, in 1814, upon the spot where he fell.

FREE BENCH (*Francus Bancus*). By custom of certain manors in England, a widow was entitled to dower out of the lands which were held by her husband in Socage (q. v.). In some places, the widow had the whole, or the half, and the like *dum sola et casta vixerit* (Co. Litt. 110, b). This right is called *francus bancus*, to distinguish it from other dowers, for that it cometh freely, without any act of the husband's or assignment of the heir (Co. Litt. 94, b). See DOWER. A widow who has forfeited her free bench is, by the custom of some manors, permitted to recover her right. At East and West Enborne, in the county of Berks, and also in the manor of Chadleworth, in the same county, and at Torr, in Devon, if the widow commit incontinency, she forfeits her estate; yet if she will come into the court of the manor riding backward on a black ram, with his tail in her hand, and will repeat certain verses (more remarkable for their plainness than their delicacy), the steward is bound by the custom to admit her to her free bench (Cowel's *Interpreter*, ed. 1727, fol.).

FREE CHURCH OF SCOTLAND, the name assumed by those who at the 'Disruption' of the Established Church of Scotland, in 1843, withdrew from connection with the state, and formed themselves into a distinct religious community, at the same time claiming to represent the historic church of Scotland, as maintaining the principles for which it has contended since the Reformation.

(It is proper to state that, in accordance with a method adopted in other cases also in this work, the present article is written by a member of the church to which it relates, and is an attempt to exhibit the view of its principles and position generally taken by those within its own pale.)

There is no difference between the F. C. of S. and the Established Church in the standards which they receive; and all the laws of the church existing and in force prior to the Disruption, are acknowledged as still binding in the one as much as in the other, except in so far as they may since have been repealed. The same Presbyterian constitution subsists in both churches, with the same classes of office-bearers and gradations of church-courts. The F. C., indeed, professes to maintain this constitution and church-government in a perfection impossible in the present circumstances of the Established Church, because of acts of parliament by which the Established Church is trammelled, and interventions of civil authority to which it is liable. And the whole difference between the F. C. and the Established Church relates to the consent and submission of the Established Church to this control of the civil power in things which the F. C. regards as belonging not to the province of civil government, but to the church of Christ and to its office-bearers and courts, as deriving authority from Him; so that the controversy is often described as respecting the *Headship of Christ* or the *Kingdom of Christ.* It is to be borne in mind, however, that the doctrine of the headship of Christ over his church, as set forth in the Westminster standards, is fully professed both by the Established Church and by the F. C. of Scotland; the only question between them is, whether or not the existing relations of the Established Church of Scotland to the state are consistent with the due maintenance and practical exhibition of this doctrine. And the question does not directly relate to *Voluntaryism* (q. v.). Those who constituted the F. C. of S. in 1843, firmly believed that the church might be connected with the state, and receive countenance and support from it, to the advantage of both; whilst they maintained that there must not, for the sake of any apparent benefits flowing from such connection, be any sacrifice of the independence or self-government of the church, as the kingdom of Christ, deriving its existence, organisation, and laws from Him. Nor has any change of opinion on this subject been manifested.

The Westminster Confession of Faith asserts 'that there is no other head of the church but the Lord Jesus Christ;' and that 'the Lord Jesus, as King and Head of his church, hath therein appointed a government in the hand of church-officers, distinct from the civil magistrate;' it ascribes to these church-officers the right of meeting in 'synods or councils,' which it affirms to be 'an ordinance of God;' and represents the exercise of church-discipline as intrusted to them as well as the ministry of the word and sacraments. It ascribes to the civil magistrate much power and many duties concerning things spiritual, but no power in or over these things themselves. And all this was equally the doctrine of the Church of Scotland before the Westminster Confession was compiled. The support which, in many parts of Europe, princes gave to the cause of the Reformation, and the circumstance that states as well as churches were shaking off the fetters of Rome, led in many cases to a confounding of the civil and the spiritual. The Church of Scotland accomplished its emancipation from Rome, not with the co-operation of the civil power, but in spite of its resistance; and after the Reformation, the Scottish Reformers and their successors were compelled to a closer study of their principles, by the continued attempts of the civil rulers to assume authority over all the internal affairs of the church. But amidst their struggles, the Presbyterians of Scotland so far prevailed as to obtain at different times important acts of parliament in recognition of their principles, and 'ratification of the liberty of the true kirk;' and finally, after the Revolution of 1688, an act ratifying the Westminster Confession of Faith itself, and incorporating with the statute law of the realm all its statements concerning the province of church-judicatories and that of the civil magistrate, and the bounds of their respective powers.

The rights and privileges of the Presbyterian Church of Scotland, guaranteed by the Revolution settlement, were expressly secured by the Treaty of Union, and jealously reserved from the power of the British parliament; yet within five years afterwards, when Jacobite counsels prevailed in the court of Queen Anne, an act was passed for the restoration of patronage in Scotland, with the design of advancing the Jacobite interest by rendering ministers more dependent on the aristocracy, and less strenuous advocates of the most liberal principles then known. This act soon became the cause of strife within the Church of Scotland, and of separation from it; effects which have continually increased to the present day. How the church at first earnestly protested against the act; how this protest gradually became formal, and was at last relinquished; how the church-courts themselves became most active in carrying out the settlement of presentees, notwithstanding all opposition of congregations, are points to which it is enough here to allude. It is important, however, to observe that in all the enforcement of the rights given to patrons by the act of 1712, during the 18th c., and considerable part of the 19th, no direct invasion of the ecclesiastical province took place on the part of civil courts or of the civil power; the presentation by the patron was regarded as conveying a civil right at most to the benefice or emoluments only, whilst the church-courts proceeded without restraint in the induction of ministers; and in a few instances it happened that the benefice and the pastoral office were disconnected by the opposite decisions of the civil and ecclesiastical courts. And even the 'forced settlements,' in which the fullest effect was given by the church-courts to the will of patrons, were accomplished according to the ancient form, upon the *call* of the parishioners, inviting the presentee to be their minister, although the *call* was a mere form—in the words of Dr Chalmers, 'the expressed consent of a few, and these often the mere driblet of a parish.'

When the 'Moderate' party, long dominant in the General Assembly of the Church of Scotland, became again the minority in 1834, the accession of the 'Evangelical' party to power was at once signalised by an attempt to restore the *call* to efficacy. This was done by the famous *Veto Law*, by which it was declared 'that it is a fundamental law of this church that no pastor shall be intruded on any congregation contrary to the will of the people,' and enacted, in order to give effect to this principle, that a solemn dissent of a majority of male heads of families, members of the vacant congregation, and in full communion with the church, shall be deemed sufficient ground for the rejection of the presentee. The Veto Law thus determined rather how strong an expression of dissent by the parishioners should be requisite to invalidate a call, than how strong an expression of assent should be requisite to give it validity; a circumstance which was afterwards much turned to account in controversy; as if the *veto* were a new and unconstitutional principle introduced; although it was certainly adopted as the least extreme mode of giving effect to the old principle which the law declared.

The same General Assembly by which the Veto Act was passed, is memorable for the assertion of the constitutional principles and inherent powers of the church in another important particular, the admission of the ministers of 'chapels of ease' to the same ecclesiastical status with the ministers of endowed parishes, in consequence of which they became members of church-courts, and had districts assigned to them *quoad sacra*, with the full parochial organisation.

The Veto Act was soon the subject of litigation in the Court of Session. A conflict arose which in various forms agitated the whole of Scotland, and which, erelong, related as much to the status of chapel ministers as to the rights of presentees to parishes; and indeed involved the whole question of the relations of civil and ecclesiastical powers, at least as far as the Established Church was concerned. The first case carried into the civil court was that of a presentation to Auchterarder, in which the call to the presentee was signed by only two parishioners, whilst almost all who were entitled to do so according to the Veto Act, came forward to declare their dissent. The decision of the Court of Session, which, upon an appeal, was affirmed by the House of Lords, was to the effect, that the rejection of the presentee on the ground of this dissent was illegal; the opinions of the judges in the Scottish court were indeed divided; but those in accordance with which the judgment was pronounced, asserted the right of the civil courts to review and control all proceedings of church-courts, a power which it was speedily attempted to put forth in other cases, to the extent of requiring presbyteries to proceed to the settlement of qualified presentees without respect to the opposition of congregations; interdicting the admission of ministers to pastoral charges even when no question of emoluments was involved; interdicting the *quoad sacra* division of parishes or any innovation on the existing state of a parish as to pastoral superintendence and the jurisdiction and discipline of the kirk-session; interdicting church-courts from pronouncing ecclesiastical censures, and suspending or revoking them when pronounced; interdicting ministers from preaching the gospel and from administering the sacraments within certain parishes; determining who should and who should not be deemed entitled to sit and vote in General Assemblies and other courts of the church; and other such things, wholly subversive of the independence of the church, and reducing it, if acquiesced in, to the condition of 'a creature of the state.' They were not, however, acquiesced in; and although in one instance, ministers were brought to the bar of the Court of Session, and reproved for disregarding its authority, their protest against its claim to authority was maintained even there; and in the far greater number of instances, its interdicts were broken without any attempt being made to call those who did so to account. It is impossible here to enter into the details of this struggle, which was brought to a final issue by the judgment of the House of Lords in August 1842, affirming a decree of the Court of Session, which required the presbytery of Auchterarder to take the ordinary steps towards the settlement of the presentee to Auchterarder, without regard to the dissent of the parishioners. The law of the land being thus decided by the supreme court to be such as they could not with good conscience comply with, and parliament having rejected an application, in the form of a 'Claim of Right,' for an act such as would have reconciled the duties of their position according to the law of the land, in the church by law established, with what they believed to be their duty towards Christ and according to his law; it now seemed to the greater number of the ministers and elders holding the principle of the independence of the church, that the only course open to them was to retire from their position by the sacrifice of the emoluments and benefits of an establishment. And this they did at the meeting of the General Assembly on 18th May 1843. Headed by Dr Chalmers, Dr Welsh, and others of the most eminent for piety, learning, eloquence, and usefulness in the church, they left the appointed place of meeting of the General Assembly, St Andrew's Church, Edinburgh, and proceeded to another place, previously prepared, Tanfield Hall, Canonmills, where, in the midst of a great concourse of people, the first General Assembly of the F. C. of S. was immediately constituted, and Dr Chalmers was unanimously called to the chair as its moderator. Four hundred and seventy-four ministers renounced their connection with the Establishment, and along with them a great body of its elders and members.

Immediate steps were taken for completing the organisation of the F. C., and extending it as much as possible into every district of Scotland. The forethought of Dr Chalmers had already devised the SUSTENTATION FUND (q. v.). The F. C. undertook from the first the continued support of all the missions previously carried on by the Church of Scotland; and all the missionaries hastened to declare their adherence to the Free Church. An 'education scheme' was soon afterwards undertaken, when it began to be found that parish schoolmasters were ejected from their office for their adherence to the F. C.; and *colleges* for the training of ministers were founded in Edinburgh, Glasgow, and Aberdeen. Considerable opposition was at first experienced on the part of landowners, who refused to grant sites for churches and other buildings; but this gradually gave way, although not until much hardship had in many cases resulted from it. The bitterness of feeling which at first existed between the Established Church of Scotland and the F. C. has passed away to a degree which could scarcely have been expected in so short a time; and there are many who hope to see the questions between them amicably discussed and settled.

In 1862 the number of ministerial charges in the F. C. of S. was 819. There are also numerous 'preaching stations,' in which preaching is regularly maintained, and other ordinances are administered under the care of presbyteries. All of these would be provided with ministers of their own, if the means at the disposal of the church admitted of it; and some of them are continually being added to the list of ministerial charges. The whole sum raised for religious and educational purposes by the F. C. of S. up to March 1861, or in about 18 years, has been about £5,533,856, or rather more than £307,000 a year. In this are included the sums devoted to the erection of churches, manses, school-buildings, colleges, &c. The Sustentation Fund for the year ending 30th March 1861 amounted to £113,462, 17*s.* 7*d.*; the missionary and educational funds to £62,487, 4*s.* 5*d.*

Since 1843, the history of the F. C. has been generally that of peaceful progress. It has been agitated by internal questions respecting the administration of the Sustentation Fund, the propriety of having only one college or more than one, &c., which are of comparatively little interest to those beyond its own pale, but which have produced no permanent divisions, and have either reached or advanced towards a peaceful solution. Latterly, however, it has again been brought into a litigation in the Court of Session, in which, according to the belief of its members, its fundamental principles are involved. The minister of the F. C. at Cardross, in Dumbartonshire, having been charged with immorality, and suspended by the General Assembly of 1858, had recourse to the

Court of Session, on the alleged ground of irregularity in the proceedings of the ecclesiastical judicatories, demanding the suspension of the sentence; and being on this account summarily deposed by the General Assembly, he raised an action in the Court of Session, not only claiming damages, but to have the sentence rescinded and found null and void. The case has not yet (May 1862) been brought to a conclusion, and no opinion can therefore be safely expressed as to its probable results or effects.

FREE CITIES, the name given to those German towns, Hamburg, Bremen, Lubec, and Frankfurt-on-the-Maine, which are of themselves sovereign states and members of the German confederation. They are remnants of the once numerous 'Imperial' cities, or cities not subject to any superior lord, but immediately under the empire. They obtained their privileges and distinctions on account of aiding the emperor against his arrogant nobles, lay and clerical, or by purchase.

FREEDOM OF THE PRESS. See PRESS.

FREEHOLD, ESTATE OF (*liberum tenementum*, frank tenement). Real estates in England in the present day are divided into freehold and copyhold. By freehold property is meant all estates which owe no duty or service to any lord but the king. What are now known as estates of freehold were, under the feudal system, denominated frank tenements. They were held by the honourable tenure of Knight's Service (q. v.) and Free Socage (q. v.), and might have been held either of the crown or of a subject. But the statute of *Quia emptores* having abolished subinfeudation, all freehold estates, except those which have been held of subjects since the time of Edward I., are now held of the crown. A freehold estate must be an estate in fee, in tail, or for life; all other estates in land, as estates for years, are called chattel interests. An estate of freehold could in general be created only by livery of sasine of Feoffment (q. v.). By the doctrine of the feudal law, no person who had an estate of less duration than for his own life or for the life of another man, was considered to be a freeholder; and none but a freeholder was considered to have possession of the land. A tenant for years, &c., was regarded as holding possession for the freeholder. The possession of the freeholder might, however, be defeated by the wrongful act of the tenant; for a transfer of possession or livery of sasine by the tenant would divest the freeholder, and leave him to his Right of Entry (q. v.). This effect of a feoffment by wrong was abolished by 8 and 9 Vict. c. 106, s. 4. Before the time of Henry VI., all freeholders were entitled to vote on the election of a knight of the shire, as they still may for the appointment of coroner. But by 8 Hen. VI. c. 7, the famous statute was passed which still in great measure regulates the county elections, and enacts that no freeholder shall vote who cannot spend from his freehold at least 40*s.* a year. By 2 Will. IV. c. 45, s. 18, this qualification is continued as to all freeholds of inheritance, and to freeholders for life in actual occupation, or who have acquired their lands by marriage, marriage settlement, devise, or promotion to any benefice or office.

FREEHOLD LAND SCHEME had for its object to enable mechanics, artisans, and other persons belonging to the lower classes, to purchase a piece of freehold land, of such yearly value as to entitle the owner to the elective franchise. Irrespective of any political object, benefit building societies now exist in most of the greater towns of this country, and are believed to be of great service to the labouring-man. See BENEFIT SOCIETIES.

FREE-LANCES were roving companies of knights and men-at-arms, who, after the Crusades had ceased to give them employment, wandered from state to state, selling their services to any lord who was willing to purchase their aid in the perpetual feuds of the middle ages. They played their most prominent part in Italy, where they were known as Condottïeri (q. v.).

FREEMAN AND FREEDMAN. In the most general acceptation of these terms, the first implies one who has inherited the full privileges and immunities of citizenship: the second, one who has been delivered from the restraints of bondage, but who, usually, is not placed in a position of full social or even political equality with him who was born free. Though the words are Teutonic (being composed of *frei*, free; and *mann*, a man or human being), the distinction between them depends on the constitution of Roman society. The equivalent for freeman (*liber homo*), indeed, comprehended all classes of those who were not slaves; but the distinction here pointed out was preserved by the application of the term *ingenuus* to him who was born free (Gaius, i. 11), and of *libertinus* to him who, being born in servitude, was emancipated. For the further development of this subject, as regards the classical nations of antiquity, see SLAVERY, CITIZEN. As the organisation of Roman society survived the convulsions of the middle ages to a far greater extent in the towns (see MUNICIPIUM, MUNICIPAL GOVERNMENT) than in the landward districts, where the institutions of feudality almost entirely superseded it, it is in the borough and other municipal corporations of this country, and of continental Europe, that we still find *freemen*, or persons inheriting or acquiring by adoption, purchase, or apprenticeship, the rights of citizenship. See FREEMAN'S ROLL. But the idea of a freeman was by no means peculiar to the Roman or Romanised population of Europe; on the contrary, it belonged to the constitution of society in all the Indo-Germanic nations. Amongst those branches of them commonly known as Teutonic, it was generally based on the possession of some portion of the soil. In Anglo-Saxon England, the freemen were divided into Ceorls (q. v.) and Eorls (q. v.), or Thanes (q. v.). See CITIZEN.

FREEMAN'S ROLL. By 5 and 6 Will. IV. c. 76, commonly called the Municipal Corporations' Act, which placed the corporate towns, or, as they are denominated, the boroughs enumerated in the schedules A and B—i. e., nearly all the boroughs in England and Wales except London—under one uniform constitution, a distinction is made (s. 2) between the Freeman's Roll and the Burgess Roll. Every person who, if the act had not passed, would, as a burgess or freeman, have enjoyed, or might have acquired, the right of voting in the election of members of parliament, is to be entitled to enjoy or acquire such right as heretofore. And it is further enacted (s. 5), that the town-clerk of each borough shall make out a list, to be called *the Freeman's Roll*, of all persons admitted burgesses or freemen, for the purpose of such reserved rights as aforesaid, as distinguished from the burgesses newly created by the act, and entitled to the rights which it newly confers; these last are to be entered on another roll, to be called the *Burgess Roll.* See BURGESS.

FREEMASON, FREEMASONRY. See MASON; MASONS, FREE.

FREE PORT (Ital. *porto franco*), is a harbour where the ships of all nations may enter on paying a moderate toll, and load and unload. Free ports form dépôts where goods are stored at first without paying duty; these goods may then be either re-shipped for export on paying a mere transit-duty, or they may pay the usual full customs of the country, and be admitted for home consumption. Free ports thus facilitate transit trade, and form, as it were, a foreign district within a state. See Warehousing System.

FREE-SPIRIT, Brethren of the, a fanatical sect of the middle ages, which was very generally (though sometimes secretly) diffused over Italy, France, and Germany, between the 13th and 15th centuries. They took their name from the 'freedom of spirit' which they claimed, in virtue of the words of St Paul (Romans, viii. 2, 14), maintaining that the true sons of God are exempt from subjection to the law. They appeared first in Alsace, in the early part of the 13th c., and attracted notice by their singular attire and their fanatical proceedings, traversing the country in troops, accompanied by women, with whom, under the name of sisters, they lived in the greatest familiarity. Their doctrine was a species of pantheistic mysticism, which they applied with fearless consistency to all the details of the moral obligations. They held, according to Mosheim, who has collected the original authorities, 'that all things emanate from God, and will revert back into Him; that rational souls are part of the Divine Being; that the whole universe is God; that a man, by turning his thoughts inward, is united inexplicably with the First Cause, and becomes one with Him; and that those who are so immersed in the vortex of the Deity attain to perfect freedom, and are divested not only of the lusts, but even of the instincts, of nature.' From these principles, they inferred that the free man, thus absorbed in God, is himself God, and a son of God, in the same sense in which Christ is called the Son of God; and that, as such, he is raised above all laws, human and divine; to such a degree that, according to some of them, 'the godlike man cannot sin, do what he may; either because the soul, being elevated and blended with the divine nature, is no longer affected by the actions of the body, or because the emotions of the soul, after such union, become in reality the acts and operations of God himself, and therefore, though apparently criminal, and contrary to the law, are really good and holy, because God is above all law!' These blasphemous and immoral principles, incredible as they may appear, are extracted by Mosheim, partly from the books of the sect, partly from the decrees of Henry, Archbishop of Cologne, by whom they were condemned. Principles such as these drew down upon the sect the arm of the state, as well as the censures of the church. No sect of the time suffered so much from the inquisition in the 14th century. They were regarded as offenders against public order and morality, as well as against the faith of the church. See Inquisition. After the first appearance of the sect in Alsace (1212), where its leader was a certain fanatic called Ortlieb (after whom the members are sometimes called Ortliebians), it spread into Thurgau and the Upper and Lower Rhine. During the latter part of that century, one of the leaders, named 'Meister Eckart,' had so large a following at Cologne, that the archbishop made his teachings the subject of a lengthened edict. The sect spread also in Swabia, where its members were confounded with the Beghards. In France, they were popularly known by the name 'Turlupins,' a word of uncertain etymology. We meet them in Bohemia in the beginning of the 15th c., and there is considerable similarity between their principles and those of the Adamites, who figure in Hussite history. From this date they are heard of no more.—See Mosheim, Soames's ed. ii. 582; also Gieseler's *Church History*, iii. 467, iv. 226.

FREE STATE, Orange. See Orange Free State, or Orange Sovereignty.

FREE'STONE, any rock which admits of being *freely* cut and dressed by the builder. In Scotland, it is synonymous with sandstone. It has also been defined as any rock which works equally freely in every direction, having no tendency to split in one direction more than another. In this sense, limestone and even granite have been called freestones.

FREE-TOWN—a name of the same significance as the *Liberia* of American origin to the south of it—the capital of Sierra Leone, a British settlement on the west coast of Africa. It is situated on the left bank of the Sierra Leone river, about 5 miles from the sea, in lat. 8° 29′ N., and long. 13° 9′ W. Pop. about 16,000. The town is pleasantly situated, and its wide streets are prettily ornamented with rows of orange, lime, banana, or cocoa-nut trees. The temperature, as one may expect from the locality, is tolerably uniform, varying in opposite seasons between the averages of 77°·6 F. and 80°·9. Towards the interior, F. is enclosed by the mountain-chain from which the colony is designated, a position to which the proverbial insalubrity of the climate is partly owing. The population, exclusive of the authorities and the garrison, consists almost exclusively of liberated negroes.

FREE TRADE. This term, when used so late as twenty years ago, expressed a disputed proposition, and was the badge of a political party; it now expresses the most important and fundamental truth in political economy. From its simplicity, it affords, to those who expect to make political economy an exact science, the hope that they have obtained at least one axiom. But it has in reality been established as the result of a double experience—the one being the failure of all deviations from it, the other the practical success of the principle during the short period in which it has been permitted to regulate the commerce of this country.

Trade consists in buying and selling. There is free trade when there is no interference with the natural course of buying and selling, if such interference be intended to improve or otherwise to influence trade. It is necessary to keep this distinction in view, because there are many laws not contrary to the spirit of free trade which interfere with buying and selling; for instance, in this country, it is unlawful to deal in slaves, because we do not acknowledge the right of one human being to be the owner of another; it is unlawful to sell intoxicating spirits without having obtained a licence, because the tax for the licence brings revenue to the Exchequer, and intoxicating liquors are a commodity which it is advisable to tax, in preference to the common necessaries of life, or even harmless luxuries. There are many of these last which cannot be sold into this country without paying customs duty, but this is for the purpose of revenue merely, not as a restraint on trade.

The many attempts made by governments to regulate trade for the purpose of benefiting the communities over which they ruled, may be divided into two great classes: the one prohibited the exportation of commodities, the other encouraged exportation, and prohibited or discouraged importation. The former was the old rule in this and in other countries. It was supposed that the wealth of the country depended on its retaining within itself certain productions of native growth or industry, and their removal out of the country was prohibited or restrained. Until a late period, the exportation of machinery was prohibited; but this was an exceptional remnant of the old principle, which had yielded to its converse, in which it was maintained that exportation is the source of wealth, and importation is a wasting of a nation's substance. On this theory the great body of British commercial and financial legislation, which received its death-blow in 1846, was founded. By it, a commercial community was then likened to an isolated human being possessed of a certain fund which he must of course spend, so as to become so much the poorer, if he buys commodities, which to him is equivalent to a nation's importing them. The notion was founded on the analogy of the miser, who will, of course, increase his store by restricting his purchases. Communities, however, are not in the position of the miser, possessing separate capital, which he can protect and increase; they rather resemble the merchant who buys and sells, making a profit on what passes through his hands. Whatever communities import, they pay for by exports. This can be shewn by analysis in any class of national transactions. If we pay for the goods we import by bills of exchange, these bills represent goods exported, otherwise they would not be paid. See EXCHANGE. If we pay for goods in bullion, it is the same thing; gold does not grow in this country, and every sovereign we send abroad to pay for goods has been got as the price of goods exported, unless it have been brought by any of our own people from the gold districts, and then it is virtually a produce of British industry. It is, in fact, a sort of dynamic law that importation causes exportation, just as a vacuum in physics is filled up by air, or the other nearest fluid.

As applied to the individual inhabitants, and not to the nation, free trade is the right of every man to do as he pleases with his capital and abilities; and as the general desire of mankind is to improve their condition, and, in fact, the greater portion of them are thoroughly devoted to this pursuit, the interests of the nation at large cannot be in better hands than in those of men who, by increasing their own wealth, are increasing the wealth of the public. The progress made by this country since 1846 has afforded a wonderful experimental illustration of this truth, since the exports have been tripled. They were, in round numbers, 40, and are now 120 millions. For more particular facts and circumstances connected with the establishment of free trade, see ANTI-CORN LAW LEAGUE, CORN LAWS, CUSTOMS.

FREE-WILL. The freedom or liberty of the will is the designation of a doctrine maintained in opposition to another doctrine, expressed by the term 'necessity.' The contest between those two views has been maintained in the fields both of theology and of metaphysics. The idea of a man being 'free' in his actions appears first in the writings of the ancient Stoics. Afterwards in Philo Judæus, an Alexandrian Platonist, who flourished at the commencement of the Christian era, there occurs an inquiry propounded, 'whether it be not the case that the upright man is free, and the vicious man a slave.' This language was evidently meant to pay a compliment to virtue, and to affix a degrading stigma on vice, and ought not to have been too literally interpreted; for in strictness it might have been maintained, with even greater plausibility, that the vicious man, who defies all the restraints of society, has the greater liberty of the two. The doctrine of freedom, as applied to the human will, was first contended for by Pelagius against Augustine's doctrines regarding the operation of grace; and in a later age was the subject of controversy between Arminians and Calvinists, the Calvinists (such as Jonathan Edwards) having usually been Necessitarians.

Although in this dispute there are certain points of real difference of opinion between the opposing parties, yet the problem has been unnecessarily encumbered with the unsuitable phraseology that has accidentally invested it. The notion of 'freedom' is intelligible when we speak of a free man as opposed to a Russian serf, or of a free press as opposed to censorship; but with reference to human actions generally, it has no particular relevancy. When a man, urged by hunger, eats the food that is before him, we recognise two separate facts, the one leading to the other: the first is a painful feeling or sensation, the other a series of movements by which food is conveyed to the system; the one fact we call the motive, the other the action, of the will following on the motive; but there is no propriety in describing this sequence as either free or not free. We may inquire into the greater or less certainty of the sequence—namely, whether a hungry man does always, as a matter of course, avail himself of the food presented to him, or whether one may be very hungry with the option of eating, and with no other motive operating to deter from the act, and yet not eat, thus shewing an absence of uniform connection between pain and the movements for alleviating it; this would be a *real* question, and would throw light on the actual constitution of the human will; the question of liberty and necessity does not present us so much with an intelligible question as with an artificial difficulty made by inapplicable phraseology. It would have been much the same to have disputed whether or not the will is rich, or noble, or royal, merely because the virtuous and right-minded man has sometimes been commended by those epithets being applied to him. The word 'necessity,' also, is ill chosen, in consequence of its great ambiguity; being applied sometimes to logical and mathematical implication, as when we say the whole is greater than its part; sometimes to the rigorous uniformity of physical laws, such as gravitation; and at other times to what is merely a high probability, as when we expect that a man of honourable and upright character will speak the truth on some given occasion. See NECESSITY.

If we cast aside these confusing phrases, and inquire what is the real matter of dispute, we shall find that there are intelligible differences of opinion in reference to the sequences of human volition. It may be maintained that our actions have the same uniformity as the successions of the physical world; and this view would be supported by a very wide induction of experience. It will be found that the whole of the complicated operations of society depend upon the certainty that men, in the same circumstances and under the same motives, will act in the same way. We allow for differences of individual character; but when once we have seen what any man is disposed to do in one instance, we take for granted that he will be similarly actuated when the identical circumstances are repeated. The whole of our trading operations are founded on the maxim that human beings prefer a greater to a smaller gain; and it has never been found that any portion of our race has taken a wayward fit, and contradicted itself on this point. We are prepared for exceptions to the rule, when other strong motives are present, but these are merely the intervention of a new force, not the suspension of the law that connects the other motive with its usual consequent. Nor is there anything degrading to human nature in this uniformity; while the opposite state of things would undermine all the securities of human life, and land us in a moral chaos. If human beings, who habitually dread pains and penalties, were suddenly, for no ulterior reason, to court hunger and cold, imprisonment and disgrace, it is obvious that there would be a speedy termination of man's career on the globe.

Still, the position thus contended for may be, and has been, called in question; or, at least certain exceptions to its universality may be put forward. We are able to comprehend the meaning of this counter-doctrine, even although we may find a difficulty in acceding to it. For example, Socrates drew a distinction between *human* and *divine* knowledge, intending by the one the departments of nature where strict law prevailed, and where by assiduous observation men might attain to certainty; such was the knowledge of the operative respecting his special craft, in which it was absurd to seek for any other source of insight than his own and other men's experience. But this did not include all knowledge. There was a department, the divine, reserved by the gods for their own special administration, and where they did not bind themselves to observe uniformity of dealing. This region included, according to Socrates, such great operations of the physical world, as the motions of the heavenly bodies, the phenomena of weather and season. To be enlightened on these, it was necessary to consult the gods by oracle and sacrifice. Now, applying this view to the case of the human will, it might be maintained that, in the greater number of instances, and in all matters of primary importance, such as self-preservation, the uniformity of human actions must be admitted; but still there may be some deep, subtle, and refined operations, where the same motives sometimes lead one way, sometimes another, the whole situation being in every other respect identical. But it lies with the supporters of this view to substantiate their exceptional cases in the midst of so much evident uniformity. As yet, nothing of the kind has ever been proved, and our only safe ground, philosophically, is what is our safe ground practically—namely, to abide by the doctrine of law in *all* human actions, on which we have not the smallest scruple as respects the preponderating mass of them.

The partisans of liberty, who take up the ground of opposition to uniform law as now expounded, not unfrequently express themselves to the following effect. Granting that the emotions of the mind have a uniform efficacy as motives, and that he that has a musical taste will be found on all occasions acting in conformity with it, still the emotions are not the whole of the mind. We have, in our mental composition, Feelings, and Intelligence, and Activity; but these do not make up our entire being. There is a something that all these inhere in, a substratum or support, which we call our 'self,' the 'ego,' or 'I,' and this abstract self is exempt from the conditions that attach to these attributes of self. This ultimate personality of every human being is free and independent, being exempt from the laws whereby our several feelings operate as motives to our ordinary actions. A self-determining power is supposed to reside here, even if excluded from the other mental adjuncts. It is considered unphilosophical and incorrect to resolve the whole of mind into feelings, actions, and intellect; these are mere attributes of an inexplicable something which each one is conscious of, and recognises as the essence or centre of the mental being, while they are merely properties or attributes. Granting the existence of this inner self, there is said to be sufficient scope for a properly free agency, without going the length of supposing that men are to contradict themselves in the everyday conduct of life.

Such a mode of stating the doctrine of liberty, however, is liable to the charge of logical confusion, not to speak of the difficulty of establishing the existence of the entity in question. If we were to inquire into what constitutes the *essence* of mind, the thing which being present constitutes mind, and whose absence is the negation of mind, we might perhaps not be able to come to a conclusion that all philosophers would acquiesce in. It is always reckoned a very abstract and metaphysical discussion to settle the essence of things; even as regards *matter*, this is not an easy question. But if 'essence' is to mean something, and not absolutely nothing, it must point to some power, property, or quality, capable of being named and signalised. Thus, we might say the essence of material bodies is the quality variously named, as resistance, momentum, inertia; all which imply that one body is at once an obstruction to other moving bodies, and a moving power when once in motion; but if any one insists that this is but one of the attributes of matter, in common with weight, extension, colour, &c., and that there must be something still deeper, in which all the various qualities inhere, we can only answer that we know of no such essence or substratum, and are incapable of conceiving any such. We may fix upon the most fundamental, the most universal, and inerasable quality of a thing, such as this property of resistance as regards material bodies, and term that the essence; while any other attempt at discovering an essence would only end in setting up fictions. So in the case of mind. If we are called on to specify any one aspect of our mental constitution more universal and fundamental than the rest, with a view to setting forth the essence of mind, we should be obliged to select VOLITION, or action governed by feeling, as the main or central fact. Wherever we can prove the existence of feeling, and of an activity controlled by that—as when an animal uses its organs to preserve its own life, to cater for pleasures, and ward off pains—we should have to admit the reality of mind, although, perhaps, the intelligence were of the lowest kind. Any being not possessing both sensibility and the power of acting in accordance with it, could not be said to possess a true mental nature. We should not trouble ourselves with considering the possible existence of a mystical 'ego,' but should at once declare that such a being did not come up to the standard or definition of mind. Will, or volition, as thus explained—namely, the direction of the active organs of a living creature to chime in with its various feelings—is itself the essence or substratum of mind, as resistance is the essence of matter. Wherefore, to speak of feelings and actions as something apart from the 'ego,' but inhering in it, is merely to count the same fact twice over, or to call a thing the attribute of itself. Volition *is* mind, and not an attribute of mind; and when we have specified the power of voluntary, or feeling-guided action, and a certain amount of intelligence, varying greatly in individuals, we have specified everything that can belong to any individual man or animal; an 'ego' beyond this is something inexplicable and fictitious. It cannot, therefore, be admitted that any foundation is given to a supposed 'free agency,' by referring to this occult and imaginary essence, any more than it would be competent to claim exceptions to the great physical laws that govern material bodies, by assuming an occult essence of matter with powers and properties at variance with its inertia, weight, extension, and other known qualities.

In one respect, the mind is differently situated from the material world in all that regards the power of tracing strict uniformity, and predicting the future from the past. Each one of us has direct access to our own feelings, but only an indirect and imperfect access to the feelings of another person. Excepting self, we can never know the whole of what any one feels; our best observations and reasonings are but approximations to the truth, and predictions founded on them are liable to be falsified through unseen forces in the arcana of another man's individuality. Admitting the uniformity of sequence of motive and act, we are never able to exhaust the motives of any single mind, beyond our own; and thus each one may be said to move in a certain inner circle of the impenetrable and unpredictable, while the large mass of the everyday actions of all human beings follows an almost undeviating regularity. This is a very important distinction between mind and matter, although not invalidating the great general fact of uniform law, as attaching to the one no less than to the other. For a sketch of the history of this great controversy, see Dugald Stewart's *Active Powers.*

FREEZING AND FUSING POINTS. See FUSING POINTS.

FREEZING MIXTURES, AND OTHER MEANS OF COOLING. When matter passes from the solid into the liquid state, heat in large quantity disappears, and ceases to affect the thermometer. See HEAT. The chemist avails himself of the fact that heat disappears during liquefaction, for the purpose of procuring artificial cold. When a piece of ice having a temperature of 32° F. is placed in its own weight of water at 174°, we find, on testing the water with the thermometer after the ice has melted, that its temperature is 32°; the heat which the water contained having disappeared during the melting of the ice. As water in passing from the solid to the fluid state possesses the property of rendering latent a greater amount of heat than any other substance, it is, when in a solid form, as ice or snow, or when combined with salts, as water of crystallisation, a powerful agent in producing artificial cold.

The substance employed in freezing mixtures should be finely powdered, rapidly mixed, and placed in vessels with little conducting power. The following are a few of the important formulæ for these mixtures: 1. A mixture of 2 parts of pounded ice or of fresh snow and 1 part of common salt, causes the thermometer to fall to — 4°. 2. A mixture of 5 parts of commercial hydrochloric acid and 8 parts of powdered crystallised sulphate of soda, causes a reduction of temperature from 50° to 0°. 3. Equal parts of water, of powdered crystallised nitrate of ammonia, and of powdered crystallised carbonate of soda, produce a cold of — 7°. 4. A mixture of 3 parts of crystallised chloride of calcium, previously cooled to 32°, and 2 parts of snow, produces a cold of — 50°, which is sufficient to freeze mercury. 5. By dissolving solid carbonic acid, or solid nitrous oxide gas, in sulphuric ether, temperatures of from — 120° to — 146° may be obtained, at which alcohol passes to the consistency of oil, and finally to that of melted wax. This is the most powerful freezing mixture that is known.

The freezing mixtures used by confectioners and those that are most convenient for ordinary experimental purposes, are the first and second of the above list.

When matter passes from the liquid to the aëriform state, heat also disappears, and the knowledge of this fact has been applied to the cooling of liquids, and to the actual production of ice. If a glass bottle containing water be covered with a cloth, which is kept constantly wet by the application of water, the evaporation from the wet cloth will soon diminish the temperature of the contents of the bottle, and if the cloth were moistened with alcohol or with ether, the cold would be proportionally greater, the degree of cold varying with the rapidity and extent of the evaporation. Wine-coolers, or water-coolers, made of porous earthenware, act in the same manner as the cloth. They are soaked in, and saturated by water, which by its evaporation occasions cold. Coolers of this kind are common in most hot countries. On the ancient monuments of Egypt, a man is sometimes represented as fanning these earthen vessels with a palm-leaf, in order to promote evaporation, and the Arabs in that country still practise this custom.

In some parts of India, where the dryness of the air allows a considerable evaporation to take place, ice is obtained in the following manner: 'Flat, shallow excavations, from one to two feet deep, are loosely lined with rice-straw, or some similar bad conductor of heat, and upon the surface of this layer are placed shallow pans of porous earthenware, filled with water to the depth of one or two inches. Radiation (see HEAT) rapidly reduces the temperature below the freezing-point, and ice is formed in thin crusts, which are removed as fast as they are produced, and stowed away in suitable ice-houses.'—Miller's *Elements of Chemistry*, 2d ed., vol. i. p. 220.

FREEZING-POINT. See THERMOMETER.

FREI'BERG, an ancient city of Germany, the centre of administration for the Saxon mines, is situated on the northern slope of the Erzgebirge mountains, on the left bank of the Münzbach, not far from its confluence with the Mulde, 20 miles south-west of Dresden. It owes its origin to its silver-mines, discovered about the year 1190. It is still surrounded by old walls and towers, and contains many interesting buildings and institutions, of which the principal are the town-house, dating from 1410, and the cathedral (1484—1512), two stately Gothic edifices, and the Berg-Acadêmie, or School of Mines, founded in 1765, the most famous institution of the kind in Europe. At the Berg-Acadêmie, instruction is given by professors in surveying, mining, the preparation of ores, geology, mineralogy, &c. It possesses lecture-rooms, a library, and mineralogical and geological collections; and has attached to it three separate laboratories, and an office for the sale of minerals. Humboldt, Werner, Jameson of Edinburgh, and many other eminent geologists and mineralogists, studied at this institution. There are, it is said, about 150 mines of silver, copper, lead, and cobalt around Freiberg. The manufactures consist principally of articles in imitation of gold and silver ware, of white-lead, gunpowder, iron and copper wares, &c. In the 17th c., it was a place of great wealth, and had a pop. of 40,000. The mines, however, have of late greatly fallen off, owing either to the richest veins being exhausted, or to the shafts being driven so deep that the water cannot be drained off from them. Pop. 15,776.

FREIBURG, or **FRIBOURG,** a canton of Switzerland, bounded on the N. and E. by Bern, and on the S. and W. by Vaud and the Lake of Neuchâtel. It has a superficies of 623 square miles, and, according to the census of 1860, a population amounting to 105,970 souls, of whom 90,362 were Catholics. More than two-thirds of the inhabitants are French; the remainder are Germans. The official language is French, but all the laws and decrees binding on the whole canton are published both in French and German. The surface of the country is hilly, the mountains in the south of the canton forming a continuation of the Bernese Alps, and rising in the highest points upwards of 7000 feet high. The principal rivers are the Saane or Sarine—which traverses almost the whole extent of the canton from its southern to its northern extremity—and the Broye. The country abounds in excellent meadows and rich pastures, upon which are reared the strongest horses and the best breed of cattle in the whole of Switzerland; indeed, the great part of the wealth of the canton consists in cows, sheep, goats, and horses, of which in proportion to its area there are great numbers. Dairy husbandry, and especially cheese-making, is pursued with great success; 40,000 cwt. of cheese are said to be made yearly. There are considerable manufactures of straw-plat, leather, cherry brandy, and tobacco. F. was received as a member of the Swiss confederation in 1481, and in 1848 a liberal constitution was established. Five members are sent from this canton to the national council.

FREIBURG, or **FRIBOURG**, a town of Switzerland, capital of the canton of the same name, is situated on both banks of the Sarine, but chiefly on a hilly promontory formed by one of its windings, about 18 miles south-west of Bern. Seen from some distance, the town has a highly imposing and picturesque appearance. Houses climb to the top, and extend to the very edge of the precipice that overhangs the river, and in another portion of the town they form terraces, the roofs of one tier being on a level with the pavement of another; while the whole is surrounded by a long rising and falling line of embattled walls, with watch-towers and gateways of ancient fortifications which still exist in a perfect state. The banks of the Sarine are united by four bridges, one of them a suspension-bridge, 906 feet long, 28 feet wide, and 175 feet above the stream, the longest bridge of a single span in the world—about 300 feet longer than the Menai Bridge. Another suspension-bridge spans the gorge of Gotteron, and is about 700 feet long, and 284 feet above the valley beneath. The church of St Nicholas, a fine Gothic structure, has an organ built by a native of F., which has 7800 pipes, one of them 32 feet long, and is considered the finest toned instrument in Europe. This church has also the highest spire and finest set of bells in Switzerland. The other principal buildings are the Cantonal School (previous to 1848 the Jesuits' College), the most conspicuous building of the town; and the Lyceum. The inhabitants of the upper portion of the town speak French; in the lower portion, German is spoken. F. has few manufactures; the chief are woollens, hardware, leather, pottery, and tobacco. Pop. 9000, of which only 500 are Protestants.

FREIBURG, a town of Germany, in the grand duchy of Baden, capital of the circle of the Upper Rhine, is the seat of an archbishop, and is situated on the Dreisam, on the western border of the Black Forest, 42 miles south-south-east from Strasburg. It is an open, well-built town; the walls and ditches with which it was formerly surrounded, have been converted into promenades and vineyards. The Minster or Cathedral of F. is one of the most beautiful and perfect specimens of Gothic architecture in Germany. It is cruciform, and built of red sandstone, was begun in 1122, and not thoroughly completed till 1513. It has a tower 367 feet high, remarkable for its elegance and lightness. In one of its chapels, the University Chapel, there are, among other pictures, a Nativity and an Adoration by Holbein, the latter considered one of his most successful pictures. The university of F. was founded in 1456; it is the Roman Catholic seminary of the duchy of Baden. The Exchange (*Kaufhaus*) is a quaint Gothic structure of the 16th century. The chief manufactures are chicory, tobacco, paper, potash, &c. Pop. 16,730, one-eighth of whom are Protestants.

FREIGHT (a word having the same origin as 'fare'), the hire of a ship, or part of a ship, for the transport of merchandise; also the merchandise so transported. The agreement for the service is termed a Charter-party (q. v.).

If a merchant freight a whole ship, but neglect to fill it, the captain is not at liberty to complete the cargo from other sources, without accounting to the merchant for any moneys received for such additional load. On the other hand, if the merchant covenant to freight a certain portion of a ship, he is bound to pay the sum agreed on for that portion, notwithstanding that his goods may fail to occupy so much space. If, in the charter-party, a day be appointed for sailing, and either the merchant fail to have his goods ready for embarkation by the time fixed, or the vessel be unprepared to start—wind and weather permitting—the agreement may be declared void by the aggrieved party, who can also recover at law for any detriment caused to his property in consequence of the delay. The use of charter-parties has been traced back as far as the reign of Henry III.

This contract, which in England, and generally in the commercial language of this country, is called freight, is more commonly spoken of by the legal writers of Scotland as Affrightment, from the French *affrètement* (Bell's *Com.* i. p. 414), but there is no essential difference in the laws of the two countries with regard to it. Throughout the whole commercial world, indeed, in so far as its provisions are not made the subjects of positive stipulation either by Charter-party or Bill of Lading (q. v.), they will be held to be in accordance with the usage of trade, and of that particular branch of trade to which the hiring has reference.

It was formerly held that the payment of the wages of the crew was contingent on the earning of freight by the ship, in accordance with the maxim of Lord Stowell, that 'freight is the mother of wages.' But this rule, which was already subject to many exceptions, has been abrogated by the Merchant Shipping Act (17 and 18 Vict. c. 104), and wages may now be recovered either by seamen or apprentices, even though no freight has been earned by the vessel. The seaman has a right to cling to the last plank in satisfaction of his wages; but in cases of shipwreck, his claim for wages will be barred if it be proved that he did not exert himself to the utmost to save the ship, cargo, and stores. This provision was first introduced by 7 and 8 Vict. c. 112, s. 17, which enacted that, in order to enable him to recover his wages, the seaman should be bound to produce a certificate from the master, or chief surviving officer of the ship, to the effect that he had so exerted himself. By s. 183 of 17 and 18 Vict. c. 104, the onus of proof is very properly laid on those who impugn the conduct of the seaman. The old rule is still adhered to in America, but it is not applied to the master, and it does not hold with reference to seamen, if the freight has been lost by the fault either of the master or owner; e. g., if the ship has been seized for debt, or for having contraband goods on board. See Kent's *Com.* iii. pp. 266, 267.

FREI'LIGRATH, Ferdinand, a brilliant lyric poet of Germany, was born at Detmold, in the principality of Lippe, 17th June 1810. He attended the high school in his native town till the year 1825, when he entered a merchant's office, first at Soest, and afterwards at Amsterdam. Encouraged by the favourable reception of his poems, he abandoned mercantile pursuits, married, and removed to Darmstadt. In 1842, a pension was bestowed upon him by the king of Prussia, whereupon he removed to St Goar, on the Rhine. This circumstance, and his poem *Aus Spanien*, deprived him of the sympathy of the liberal party, which, however, was restored to him twofold when, in 1844, he gave up his pension, and in his political poems attached himself to the democratic party. The publication of his *Glaubensbekenntniss* (Confession of Faith), in the same year, compelled him to take refuge abroad. He went to Belgium, Switzerland, and in 1846, to London, where he resumed his mercantile pursuits, and became correspondent for the banking-house of Huth & Co. He was about to accept an invitation to America, sent him by Longfellow, when the events of 1848 recalled him to his native country. F. settled in Düsseldorf, where he became the most important member of the democratic party, and sang the praises of democratic socialism. He was impeached on account of his poem *Die Todten an die Lebenden* (The Dead to the Living). The interest felt in this trial was extraordinary. F. was defended by celebrated advocates, who did not fail to ridicule the folly shewn in prosecuting a man for writing poetry. The doctrine that the poet is a 'chartered libertine' in the expression of his sentiments, carried the day, and F. was acquitted, 3d October 1848. The consequence was inevitable. His poem immediately became the rage; the first edition was sold off in Düsseldorf within a few hours, and thousands of correct and incorrect impressions were circulated over all Germany. A second prosecution induced F. again to withdraw from his native country, and since 1849 he has resided in London. F.'s principal productions are his *Gedichte* (Stüttg. 1838; 18th edit. 1857); *Ca Ira* (Herisau, 1846); *Die Revolution* (Leip. 1848); and *Neuere politische und sociale Gedichte* (Col. 1849). A complete edition of his works appeared at New York (*Sämmtliche Werke*, 6 vols. 1858—1859). F.'s poems display lively imagination, fire and melody of rhythm, a richness of execution, and a picturesque originality of style, which not seldom, however, passes into eccentricity and merely 'spasmodic' force of expression. His translations, it should also be observed, are admirable, especially of the poems of Victor Hugo, Robert Burns, and Longfellow's *Hiawatha*.

FREI'SCHÜTZ, the free-shooter, is the name given in the legend to a hunter or marksman who, by entering into a compact with the devil, procures balls, six of which infallibly hit, however great the distance, while the seventh, or, according to some versions, one of the seven, belongs to the devil, who directs it at his pleasure. Legends of this nature were rife among the troopers of Germany of the 14th and 15th centuries, and during the Thirty Years' War. The story first appeared in a poetic form in 1810 in Apel's *Gespensterbuch* (Ghost-book, Leip. 1810—1815), and F. Kind adapted the story (Leip. 1843) to the opera composed by Weber in 1821, which has made it known in all civilised countries.

FREI'SING, a town of Bavaria, is situated in a fruitful, agreeable district on the left bank of the Isar, 20 miles north-east of Munich. The town was the seat of an episcopal prince till 1802, when the see was secularised. The bishopric of F. dated as far back as 724 A. D., but its bishops were first made princes by the Emperor Ferdinand (1619—1637). The chief buildings are the palace formerly of the bishop, and a beautiful cathedral, dating from the 12th c., having three naves, two towers, and a singular crypt, the pillars of which have monsters crawling up their shafts. Pop. 6000, who carry on brewing and distilling, and manufacture vinegar, tobacco, saltpetre, &c.

FRÉJUS (anc. *Forum Julii*), a small town of France, in the department of Var, is situated a mile inland from the embouchure of the Argens (anc. *Argenteus*) into the Mediterranean Sea, and 15 miles south-east of Draguignan. It was originally a colony from Marseille, and was afterwards colonised anew by Julius Cæsar, and called Forum Julii. It has remains of ancient Roman walls, and of a Roman circus and viaduct. The ancient harbour, at one time the most important Gallic port, and in which Augustus posted the fleet of 300 galleys which had been captured from Antony at Actium, has become silted up. Here, or rather at the new harbour of St Raphael, 1½ miles off, Napoleon landed on his return from Egypt in 1799, and embarked for Elba in 1814. Pop. 2665.

FREMONT, John Charles, a distinguished explorer, born at Savannah, in Georgia, January 21, 1813. His father was a Frenchman, his mother a native of Virginia. At the age of 15, he entered the junior class of Charleston College, South Carolina; but he left that institution without taking a degree. From 1830 to 1833, his time was chiefly employed in teaching in Charleston. In 1833, he was appointed teacher of mathematics on board of the United States sloop-of-war *Natchez*, in which he made a cruise of more than two years. After his return, he became assistant-engineer under Captain Williams, then engaged in a preliminary survey for a railway between Charleston and Cincinnati. In the spring of 1838, he accompanied M. Nicollet, as his principal assistant, in the exploration of the region north of the Missouri river. While occupied with these important labours, he was appointed by President Van Buren second-lieutenant in the corps of Topographical Engineers.

In the early part of 1842, F. was appointed to the command of an expedition sent out to explore the country between the Missouri river and the Rocky Mountains. He set out from St Louis near the end of May, and reached the South Pass (about 42° 30′ N. lat., and 109° 30′ W. long.) in the Rocky Mountains, in August. In the vicinity of the pass, he ascended a lofty peak (since known as Fremont's Peak), which he found to be 13,570 feet above the level of the sea; this is the highest summit of the Rocky Mountains yet measured within the limits of the United States. He returned to St Louis about the middle of October. Throughout the entire route of the exploration, F. had made careful barometrical and astronomical observations, for the purpose of ascertaining the elevation and position of the different points, besides noting the character of the soil, and adding largely to the sciences of geology and botany.

In 1843, he set out on another expedition, planned on a more extensive scale. Passing beyond the Rocky Mountains, he partially explored a remarkable tract of country, to which he gave the name of the Great Basin (q. v.). Having advanced as far as Fort Vancouver, about 90 miles from the mouth of the Columbia River, on the 10th of November the party commenced their homeward journey. They soon found themselves traversing, in the depth of winter, a wild and desert region, in many parts of which it was impossible to obtain any pasture for their horses and mules, while, in the most favoured portions of their route, grass was to be found only in a few sheltered spots. At length, after incredible hardships and sufferings, finding that it was in vain to attempt to reach the United States at that season, F. resolved to strike directly across the Sierra Nevada, towards the vales of California. Although assured by his Indian guides that it was quite impossible for any man to cross those mountains, he boldly undertook the desperate enterprise, and on the 6th of March succeeded in reaching Sutter's Fort, an American settlement in California, near the river Sacramento. More than half of his animals had perished on the way, and those that remained, though bearing no burden, had scarcely strength to drag themselves along. The expedition returned to the United States in the summer of 1844. In acknowledgment of his important services, F. was raised, January 1845, to the rank of brevet-captain. The fame of his discoveries, joined to the heroic daring and fortitude which he had exhibited in his last expedition, not only made him the theme of enthusiastic admiration in the United States, but soon spread his name to the remotest parts of the civilised world. In 1846, F. having again led a company of explorers into California, took an active part in the war against Mexico. Becoming involved in a dispute between two of his superior officers as to the right of command in California, F., on his return to Washington, was censured for disobedience; and as he could not admit the justice of the decision against him, he resigned his position in the army.

In 1848, F. set out on a fourth expedition to California at his own expense. Attempting to cross the mountains between the Rio Grande and the Colorado in mid-winter, the guide mistook the way, and F. lost all his animals and one-third of his men. In 1849, he settled in California, and in December of that year was chosen senator to represent the new state in the national congress. In 1850, he received from the king of Prussia, through Baron Humboldt, 'the great golden medal for progress in the sciences;' and about the same time the Royal Geographical Society of London awarded him the 'founder's medal for pre-eminent services in promoting the cause of geographical science.' In 1856, he was nominated by the republican party as their candidate for the presidency. In the contest that followed, James Buchanan was elected president; but F. received the votes of eleven of the northern states.

Early in the history of the civil war in the United States, F. was appointed major-general in the Federal army.

FRENCH BEANS. See Kidney Beans.

FRENCH BERRIES, Avignon Berries, Persian Berries, or Yellow Berries (Fr. *Graines d'Avignon*), small berries, the fruit of certain species of Buckthorn (q. v.), but principally of the Yellow-berried Buckthorn (*Rhamnus infectorius*), used by dyers in dyeing yellow. For this purpose, they are gathered unripe, and dried; they yield a rich yellow colour, but it is fugitive, and on this account the use of this dye-stuff has very much given place to that of mineral dyes. It is, however, still imported into Britain from the Levant and from the south of France. That from the Levant is the best. The yellow-berried buckthorn is a very spreading procumbent shrub, with ovato-lanceolate smooth leaves, growing naturally in rough rocky places in the countries near the Mediterranean. It is cultivated to some extent in the south of France.

FRENCH HONEYSUCKLE (*Hedysarum coronarium*), a beautiful biennial plant of the natural order *Leguminosæ*, sub-order *Papilionaceæ*, with branching and spreading stems, pinnate leaves, scarlet or sometimes white flowers, and jointed pods, which have one seed in each articulation. It has fine foliage, and a very elegant appearance, and is often to be seen in flower-gardens. It is a native of the south of Europe, and is there pretty extensively cultivated as food for cattle. It grows to a height of four or five feet, yields a large crop, and is very nutritious. It is used either in a green state, or dried as hay. It requires a rather warmer climate than that of England for its profitable cultivation. The genus *Hedysarum* contains many species, extensively diffused over the warmer parts of the world. A few are found in cold regions, as *H. fruticosum* in Siberia, growing in sandy soils, very useful in fixing them by its roots, and valuable as affording food for horses.

FRENCH LANGUAGE AND LITERATURE. The *French language* has been developed under the combined influence of numerous forms of speech, among which Latin, as in every other tongue of Western Europe, takes a principal part. It would appear that in the 4th and 5th centuries of our era, the whole of Gallia, from the Rhine to the Pyrenees, had adopted the language of the Roman conquerors, not the polished speech of the classic writers—the *sermo urbanus*—but the form of Latin that had become common to all the subjugated provinces of Central Europe—*lingua Romana rustica.* Suetonius, Pliny, Juvenal, and Martial make frequent reference to the Latin in use in Southern Gaul and Spain; and in the 4th c. we find that, under the Emperor Theodosius, the Roman senate was addressed by an orator of Gaul in rude and uncultured transalpine Latin. At this period, and much later, Latin was employed in the provincial assemblies of Gaul; but in the 7th c., two other forms of speech had come into general use—a provincial dialect of the *lingua Romana*, and a form of German known as the *lingua Theotisca.* The latter which was probably a mingled jargon, used in common by the Frankish and Teutonic tribes, and consequently in vogue in the north and east, received a more definite development under Charlemagne, who caused a grammar of it to be prepared for the use of the schools which he had established, and in which it was taught conjointly with Latin. The council of Tours (813) recommended the use both of the rustic Latin and the Teutonic dialect; and in 842, in the compact made between the two brothers, Charles the Bald and Louis the German, the former swore in the *Romana rustica*, and the latter in the *Teutsche* language, which, although it had been generally spoken at the court of Charlemagne, had already given place in France to the Frankish form of Latin. This Gallo-Romanic idiom early branched off into the two characteristically different forms of the *Provençal* or *Langue d'oc* of the south, and the *Roman Wallon*, or *Langue d'oil* of the north. The comparative prosperity which the south of France enjoyed, first under the kings of Arles, and subsequently under the counts of Provence, its freedom from foreign aggression for several centuries, the beauty of the climate, and the more thoroughly Romanised character of the people, led to the early development of the Provençal, and, by the lips of the troubadours, breathed forth a rich melody of song, which, after a time, was re-echoed in less harmonious tones by the *trouvères* of the north in their ruder tongue. The earlier productions of these two schools exhibit striking differences in diction, inflection, and construction; and while the troubadour sang of love, and dwelt on the beauties which a southern climate and a fruitful soil scattered broadcast over the face of nature around him, the northern *trouvère* invented a chivalrous mythology of his own, and ascribed to the heroes of Greece and Rome, and the brethren in arms of King Arthur and Charlemagne, the sentiments of his own times. The use of the northern or Walloon French was very considerably extended through its adoption by the Normans, who in time carried it under William the Conqueror to England, and, under the northern leaders of the Crusades, to the south and east. In the south, on the contrary, the cruel persecutions of the Albigenses, against which the troubadours inveighed aloud, checked the development of the Provençal language; for the songs of the troubadours were proscribed, and thus the use of the *langue d'oil* soon extended with the spread of northern power into the provinces of Provence and Languedoc.

One of the earliest monuments of the French-Walloon, in the form in which it shews evidence of its gradual development into modern French, is the *Roman de Rou*, a versified chronicle of the exploits of Rollo and his successors, composed by Robert Wace. In this composition, the language is no longer the sonorous, many-vowelled Provençal, or the mongrel Latin of the *lingua rustica*, but a distinct form of speech. The language thus formed by the ingrafting of Norman, Frankish, and Teutonic idioms on the degenerate Latin of the Gallic provinces, was rapidly developed under the fostering influence of the university of Paris and the Sorbonne, which already, in the 13th c., attracted the learned men of all nations to their schools. The *Roman de la Rose*, begun in the 13th c. by Jean de Meung, and completed in the 14th c. by G. de Lorris, and *Guyot's Bible*, belonging to the same period, are typical of the literature of France in the middle ages, which consisted chiefly of tales of chivalry and coarse sallies against the clergy. Froissart's chronicles of the 14th c., which afford a vivid picture of the wars of the English and French, in which he himself took an active share, are written in a dialect that is quite comprehensible to the modern student. Comines, who wrote in the 15th c., is a less picturesque narrator; but he may be classed among the earliest true historians of his country, for he was one of the first who observed public events with judgment, and recorded what he had seen in a straightforward, truthful manner. Francis I., by his love of music, song, and dramatic representations, gave indirect encouragement to literature; while the French language acquired force and terseness through the writings of Rabelais, Ronsard, Amyot, and Montaigne; and although, under the regencies of Catharine and Marie de' Medici, Italian writers were more patronised at court than native authors, the language and the literary talent of the nation were undergoing a process of gradual development, which was completed by the establishment, under the auspices of Richelieu, of the *Académie Française* in 1634. At this period, Corneille brought French tragedy to its highest point of grandeur in the classic style of the drama, which he had adopted. His best pieces are *Le Cid*, *Les Horaces*, *Cinna*, &c. Pascal, in his *Lettres Provinciales*, established a standard of French prose; while Descartes, in his *Discours sur la Méthode*, shewed the adaptability of the language to subjects requiring conciseness and precision. A long galaxy of great names gave splendour to the reign of Louis XIV. in every branch of literature. Notwithstanding the frivolity of the habits of the higher classes in France during this period, no age produced more vigorous writers or original thinkers. Bossuet and Flechier won respect by their noble funeral orations; Bourdaloue and Massillon, by their eloquent preaching; Fénélon, by his learning and earnest exhortations; and Pascal, by his Christian view of the great questions of human experiences. In dramatic literature, Racine and Molière stand forth conspicuous among a host of lesser writers, the former pre-eminent in tragedy, as his *Andromaque*, *Iphigénie*, *Phèdre*, testify; the latter inimitable in comedy, and exhibiting wonderful powers of delineating human character from a humorous point of view, that have never been surpassed. Among his best pieces we may instance *Tartufe*, *Le Misanthrope*, and *Les Femmes Savantes*. La Fontaine is alike well known among his countrymen for his moral Fables and his licentious Tales. La Rochefoucauld and La Bruyère, in their *Sentences* and *Caractères*, depicted human character, with its peculiarities, inclinations, and foibles in strong, humorous, and vivid touches. This was the age of Memoirs and Letters: in the former branch of contemporary history, Cardinal Retz was perhaps the most successful of the host of writers who gained a reputation in this special department of literature; while Madame de Sévigné's letters are models of easy epistolary style, and afford a lively picture of the times. This age, in which, at anyrate, the *semblance* of religion had been respected, was followed by one of scepticism, infidelity, and philosophical speculations of the wildest kind. Four men of genius, Montesquieu, Voltaire, Rousseau, and Buffon, contributed, to a very great extent, by their writings, and the influence which they exerted on the minds of their contemporaries, in bringing about the Revolution. Montesquieu, by his philosophical dissertations on the laws and government of his country, taught the French to take more enlightened views of the rights and duties of different classes of society, and thus naturally roused the angry passions of the oppressed lower orders; while the passionate eloquence of Rousseau won a hearing for doctrines which were entirely subversive of moral obligations, and recognised no higher standard than human inclinations. Voltaire's versatility of powers, which were exercised with equal ease, and nearly equal success, on tragedy, satire, romance, poetry, history, and philosophy, enabled him, to the end of his long life, to maintain the supremacy over public opinion, which he had won in his youth. Buffon devoted himself to the study and description of nature, and his *Histoire Naturelle*, which inaugurated a new era in the literature of natural history, is a remarkable monument of the science and learning of that period. Diderot, and D'Alembert the geometer, founded the *Encyclopédie*, which, while it gave a lucid summary of numerous branches of human knowledge, was always hostile to religion. The Revolution, which had been materially accelerated, if not produced, by the inspirations of men of consummate intellect, was not favourable to literature. A period of almost complete intellectual torpor succeeded the active mental development that had characterised the preceding classic and philosophic periods. The Empire was scarcely more propitious to learning; but with the *Corinne* and *L'Allemagne* of Madame de Staël, and *Les Martyrs* of Chateaubriand, a reaction took place; and these productions of the new romantic school were soon followed by numerous others, either belonging to the same, or to the rival classical school. Among the host of young and original writers who now acquired reputation, we may instance, in dramatic art, poetry, and fiction, Alexandre Dumas, Victor Hugo, Alfred de Vigny, and Fréderic Soulie. The first of these has been one of the most prolific of novel-writers; among his most popular works are—*Les Trois Mousquetaires*, *Le Comte de Monte Christo*, *Le Collier de la Reine*, &c. Casimir Delavigne has attempted to combine the romantic and classical schools in his *Louis XI.*, *Les Enfants d'Edouard*, &c. George Sand (Madame Dudevant) is one of the most elegant writers of her country, and her works are models of style. Her *Indiana*, which appeared in 1832, inaugurated a new era of emotional novel-writing, and has had numerous imitators. Among her numerous works, the most popular are *Jacques*, *Lélia*, *Mauprat*, *André*. Of late years, she has written almost exclusively for the stage. *Les Mystères de Paris*, and *Le Juif Errant*, which depict the concealed miseries and depravities of social life, quickly brought their author, Eugène Sue, into notice. The tendency to materialism and sensualism, which characterises the works of the two last-named writers, is more or less perceptible in all belonging to their age in France. The few artistic and good historical novels that have appeared have met with little success among the general public. Among original and finished writers of tales, A. de Musset ranks foremost, while Mérimée the historian, who has written several novels of very great merit, has not always met with the success which he deserved. Of late years, a host of young writers have appeared, some of whom belong to what they themselves term the realistic school. A. Dumas the Younger, who is following in the steps of his father, E. Feydau, O. Feuillet, and E. About, all deserve notice. Poetry has not been followed with any marked success in France during the present century; and beyond the great names of Béranger—whose songs are unsurpassed in any other tongue—Victor Hugo, Lamartine, and Musset, there are few French poets of the present day known beyond the limits of France. The theatre absorbs much of the talent of Young France; but here light pieces, vaudevilles and farces, are the most successful, as is testified by the host of comedies and operatic scores for which Eugène Scribe has obtained a favourable reception. History is undoubtedly the most successful branch of modern French literature. Among those who have gained for themselves a world-wide reputation in this department of research, we would instance Barante, whose early work, *L'Histoire des Ducs de Bourgogne*, has been followed by the recent publication of histories of the *Convention* and *Directory*. Guizot, another writer holding monarchical views, has shewn indefatigable powers of research and a philosophic power of generalisation in a great number of works, among which the first rank may be awarded to his *Essais sur l'Histoire de France*, and *L'Histoire de la Civilisation en Europe*. Thierry, in his *Lettres sur l'Histoire de France*, and *L'Histoire de la Conquête de l'Angleterre par les Normans*, displays great powers of narration and aptitude for theoretic criticism, perhaps more imaginative than sagacious. Sismondi has shewn great research and profound knowledge in his somewhat diffuse History. Thiers has devoted his learning, industry, and powers of delineation to the exposition of the revolutionary and imperial phases of French government. Michelet and Louis Blanc are both known for their democratic principles; the latter, in his *Histoire de Dix Ans*, gives one of the most vivid pictures of contemporary history that we possess. Lamartine, who carries his poetic inspirations and enthusiastic temperament with him into his historical researches, presents magnificent but not perfectly trustworthy pictures of history in his *Histoire des Girondins*, *Histoire des Constituents*, and *Histoire de la Restauration*. Villemain, although better known for his history of literature in the middle ages and in the 18th c., is yet to be classed among historians as the author of *Histoire de Cromwell*, and his *Souvenirs Contemporains*, &c.

There is no department of the moral and physical sciences that has not been enriched and elucidated by the labours of French savans. Among the great scientific writers of modern France, we may instance in metaphysics and political economy, Victor Cousin, Jouffroy, Simon, and Lamennais, whose eloquent defence of spiritualistic and religious principles reacted strongly against the materialism to which French philosophy had long been addicted; while socialism has found powerful advocates in Comte, St Simon, Fourrier, and Leroux. Chevalier, De Tocqueville, Bonald, and Laferrière, are known for their able and philosophic exposition of the jurisprudence of nations, and the social and political condition of democracy in the new and old world. In philology and ancient history, Champollion, Sylvestre de Sacy, Renau, Remusat, and Stanislas Julien, by their profound researches into Egyptian hieroglyphics and Semitic literature, have thrown new light on the origin of races and languages. In mathematics D'Alembert, Laplace, Lagrange, Biot, Ampère, and Arago stand unrivalled. In natural history, and its kindred sciences, among a host of great French discoverers, we can only instance a few of the more distinguished, as Cuvier, Geoffroy and Isidore St Hilaire, Blainville, Jussieu, D'Orbigny, Haüy, Gay-Lussac, Elie de Beaumont, Milne-Edwards, Brongniart, whose services in the cause of science have identified their names with the triumphs of physical research.

No country has ever produced a greater number of elegant essayists and literary critics than France, and no language seems to lend itself more readily than French to a concise and graceful, yet forcible style of epigrammatic writing, and few admit of more idiomatic terseness, or a more polished play of words. French literature has of late years been suffering from the state of torpidity which seems in France to be the natural secondary effect of any great political movement, and hitherto the imperial rule has not been propitious to the development of original literary talent.

For authorities on French literature, see Nisard, *Hist. de la Littér. Française* (1846); Baron, *Hist. Abrégée de la Littér. Franç. jusqu'au* 17*me Siècle* (1841); *Hist. Littér. de la France*, by Dom. Rivet, and other Benedictine monks, continued by members of the Institute (22 vols. 1733—1858); Villemain, *Tableau de la Littér. au Moyen Age* (1857); Demogeot, *Hist. de la Littér. Franç.* (1857).

FRENCH POLISHING, the name given to the now common method of coating wood with a fine smooth surface or varnish of gum-lac. Gum-lac is easily soluble in spirits of wine, methylated spirits, or wood-naphtha, and a varnish is thus produced; but if it be applied simply with a brush, as copal, mastic, and most other varnishes are applied, the result is a very rough and broken surface, instead of a smooth continuous polish. To obtain this with a lac-varnish on wood, it is necessary to apply a very small quantity at once, and to rub it continuously until it dries. If a dry rubber be used, the lac sticks to it, and it is dragged from the wood. An oiled rubber is therefore used, and the oil should be a drying oil, such as linseed. Various kinds of rubbers are used; such as a ball of wool covered with rag, a small roll of cloth with the edges downwards, and likewise covered with rag. The varnish and oil may be mixed together in a bottle, shaken up when used, and a little poured upon the rubber; or a simple solution of shell-lac may be used, and some of this laid upon an oiled rubber. Several successive coats and rubbings are required, and some skill is necessary, in order to produce a good surface.

The following are some receipts for French polish for mahogany; they might be multiplied to a great extent, for they should be modified according to the kind of wood to which they are applied, and the mode of applying them: 1. 5 oz. of pale shell-lac, dissolved in 1 pint of wood-naphtha, or methylated spirit, or spirits of wine. 2. 5 oz. of pale shell-lac, 1 oz. gum sandarac, 1 pint spirit. 3. 1¼ lb. pale shell-lac, ¼ lb. mastic, 2 quarts spirit. 4. Shell-lac, 6 oz.; spirit or naphtha, 1 pint; linseed oil, ¼ pint. The last is the most easy to apply; it requires no oil on the rubber, and is a very good domestic polish for restoring furniture, if properly applied by careful and continuous rubbing.

FRENCH PROTESTANT CHURCH. See HUGUENOTS.

FRENCH RIVER, a stream of Upper Canada, empties Lake Nipissing into Lake Huron, entering Georgian Bay, in lat. 45° 53′ N., and long. 81° 5′ W.

It has a rapid course of about sixty miles; and, towards its mouth, is so uniform in breadth and depth, as to resemble an artificial cut through bare rock. It forms part of the route by which canoes, preferring the Ottawa to the St Lawrence, pass from Montreal to the Red River of the north.

FRENCH SETTLEMENTS. See PONDICHERRY.

FRÉRON, ÉLIE CATHERINE, a French writer, was born at Quimper in 1719, educated under the Jesuits at the college of Louis le Grand, and first acquired a reputation by his publication of a critical journal in 1746. This journal appeared under the curious title, *Lettres de Madame la Comtesse de * * **. It was suppressed in 1749, but virtually re-appeared as *Lettres sur quelques Écrits de ce Temps* (13 vols., 1749—1754), and was again continued under the title of *Année Littéraire* (1754—1776). F. exhibited the most intense bitterness against his leading contemporaries. A worshipper of the age of Louis XIV., he hated and satirised the levelling philosophy of his times. Voltaire was the special object of his aversion, and that sensitive scoffer was deeply galled by the weekly diatribes of his antagonist. The names of Voltaire and F. are inseparably, though not amicably, conjoined in the history of literature. F. was often right in his criticisms and in the accusations which he brought against his adversaries, but opinion in France in the 18th c. was swayed by epigrams, and F. fell a victim to the animosity of the wits. He died of grief, March 10, 1776.—LOUIS STANISLAS FRÉRON, a son of the former, was born in Paris in 1765, played a somewhat prominent part in the melodrama of the French Revolution, and in 1802 was sent as sub-prefect to the island of St Domingo, by the First Consul, but died two months after his arrival.

FRE'SCO, FRESCO-PAINTING, or PAINTING IN FRESCO, the term applied to paintings executed upon plaster while it is still wet or fresh (Ital., *fresco*). Many celebrated artists and well-known writers have maintained that fresco is the only way in which the highest efforts in art should be embodied. A very large proportion of the best works of the Italian schools, particularly those of Rome and Florence, are done in this manner; and during the present century it has been revived, and many of the chief paintings of the modern German school are executed in fresco. The practice has to some extent been introduced into Britain, and certain works of that kind have been executed, and others are in progress, in the new Houses of Parliament.

Before noticing more particularly the various properties claimed for fresco-painting, it is proper first to describe the process. A cartoon or drawing on paper is first made of the subject. This must be executed with a correct outline, and the shading and effect fully made out. The finished cartoon may either be of the same size as the intended fresco, or it may be done on a smaller scale; but, at all events, an *outline* of the same size as the fresco-painting is necessary. When the finished cartoon is made the same size as the fresco, it is generally executed in black and white, with chalk or charcoal, but it is essential to have also a careful study of the subject in colours, and this is in most cases done on a small scale. The colours used are mostly earths or minerals, as few others will stand the action of lime: these are ground and applied with pure water. The ground to be painted on is the last or smooth coating of plaster that is laid over the rough plaster-work with which walls are prepared. This last coating, or ground, or rather as much of it as the artist calculates on being able to cover in one day, is laid on immediately before he commences work. The surface is wet, but firm and smooth; the tracing is laid over the portion prepared, and the artist, with a point of hard wood or bone, goes over the lines of the tracing, and slightly indents them on the plaster. He then proceeds with his work, the finished cartoon and coloured sketch being hung or placed near him for his guidance. After his day's work is over, any portion of the plaster that has not been painted on, or that may remain beyond or at the edge of his work, is cut away; and next day, when the painter is ready to commence work, the plasterer is at hand, and joins closely another portion of plaster to the edge of the portion painted on the previous day, which, when cut, had been slightly sloped. The lime, in drying, throws out a kind of crystal surface, which protects the colour, and imparts a degree of clearness much superior to, and easily distinguishable from, that of a work in tempera or size paint. This process, although apparently simple, nevertheless requires great dexterity and certainty of hand; for the surface of the plaster is delicate, and must not be overworked, besides, the lime only imbibes a certain quantity of additional moisture in the form of liquid colours, after which it loses its crystallising quality, and the surface, or a portion of it, becomes what painters call rotten. Many frescoes are defective in this way. It is only after the lime has dried that such flaws are discovered; the proper plan, in such a case, is to cut away the defective portion, have fresh plaster laid on, and do the work over again. But the flaws are too often retouched with tempera or size colours; and though they may escape notice for a time, the parts touched will change or come off in the course of a few years. Another difficulty in fresco is, that the colours become much lighter after the plaster dries, and for this allowance must be made. However, by practice, the painter may soon get over this difficulty; and he can test the difference between the colour as wet and as dry, by putting a touch on a piece of umber he has generally at hand, which instantly dries the colour, and shews it as it will be when the lime has dried.

The pre-eminence claimed for fresco-painting is founded on—1. The quality it possesses of clearness and exhibiting colours in a pure and bright state. The surface not being dry and dull, as tempera or size colour, nor glossy like oil-paintings, is capable of being favourably viewed from any point. 2. Its durability—many frescoes being painted on arcades or the cloisters of churches open on one side, some on the fronts of houses entirely exposed in the open air. 3. The skill and dexterity required in execution—retouching not being admissible, nor those various appliances of glazing over painting, &c., available in working with oil-colours; all which circumstances compel the fresco-painter to confine his energy more to the subject and design, than to the mechanical qualities so much sought after by painters in oil. The frescoes by M. Angelo in the Sistine Chapel, by Raphael in the stanze of the Vatican, and those in the cupola of the cathedral of Parma by Correggio, are pointed to by the advocates of this mode of art as settling the question.

But, on the other side, it may be said—1. Though a certain degree of clearness and purity of colour results from fresco, it is deficient in depth and richness. The absence of glossiness is no doubt an advantage in the case of mural-painting with reference to architectural decoration; but to a considerable extent this difficulty can be obviated in the case of painting in oil; and Delaroche's great picture of the Hemicycle in the Beaux Arts in Paris, which is in oil, is not objectionable on that ground

—indeed, many mistake it for fresco. 2. No doubt, in fresco, the colours are not liable to change much, if the work be executed in pure fresco, and not retouched; but, generally speaking, the surface is fragile, and easily broken or scratched, and there is no way of mending it but by retouching with tempera colours; and if that be extensively done, its nature is altered, and it becomes a picture in size colours. The 'Madonna de Foligno,' 'Madonna di San Sisto,' 'Sposalozia,' and other celebrated easel-pictures by Raphael, are in much better preservation than his frescoes in the stanze of the Vatican. 3. The properties of difficulty in execution and limited range of colouring, and of technical appliances, are of a negative kind. No doubt, some painters have maintained that good colouring is incompatible with grand compositions; but, on the other hand, Titian's 'Entombment' in the Louvre, and Peter Martyr in Venice, among others, are referred to as rebutting such an assertion.

Mural-painting is of great antiquity: in Egypt, in the Etruscan tombs, on the walls of houses in Pompeii, and in the catacombs, there are various remains of paintings which are generally considered to be frescoes; those in Pompeii, in particular, are remarkable for grandeur and purity of style in design and drawing; but they are executed in a slight and free manner, and on this account, and from the same or nearly similar subjects being often found repeated, are supposed to be copies by house-decorators of celebrated paintings that were preserved in temples or palaces at Rome. Whether these were frescoes painted on the walls or movable pictures, is matter of dispute. 'The Greeks preferred movable pictures, which could be taken away in case of fire, or sold if necessary.'—Wilkinson on *Egyptian and Greek Paintings*. Pliny says Apelles never painted on walls; and various pictures of immense value are stated to have been taken from Greece to Rome.

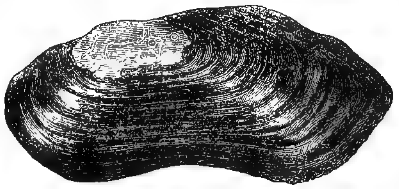
On the whole, it may be assumed as an opinion that has long been generally adopted, that where painting is to be combined with architecture, fresco is the style that assimilates most with it. On the other hand, the fact of Delaroche having so successfully executed in the Beaux Arts a work in oil, which by size and subject was so well adapted for fresco, and the circumstance of the adoption lately in Germany, and by the artists in our Houses of Parliament, of stereochromic painting (see below) in place of fresco—a method by which certain defects in the process of fresco-painting are said to be obviated—militate against the soundness of some of the opinions hitherto adopted as to the advantages ascribed to fresco-painting.

Fresco Secco is a spurious kind of fresco, much used in Italy in ordinary house-decoration. The colours, mixed in water, are laid on the wall after the plaster is dry, and adhere in a certain degree by absorption, the hard or glassy surface which forms on plaster after it dries being first removed by pumice or otherwise. Pictures executed in this manner look coarse and dry, or rotten, and are in every way inferior to pure fresco.

Stereochromic Painting (Gr. *stereos*, firm, and *chroma*, colour).—The ordinary process of fresco secco, however, has lately assumed very great importance from a discovery by the late Dr J. R. von Fuchs of what is called water-glass (see FUCHS'S SOLUBLE GLASS), which, being passed over the surface of a work executed in fresco secco, imparts much brilliancy, and fixes and gives great durability to the colours; this method is styled stereochromic painting, and is now extensively practised in Berlin by Kaulbach and other eminent German artists. The late Prince Albert was so much impressed by the bearing which this discovery would have on the art of mural-painting, that he translated from the German a pamphlet describing the 'manufacture, properties, and application of water-glass (soluble alkaline silicate), including a process of stereochromic painting,' and printed it for private circulation. Mr Maclise, R.A., made use of this new style of art in executing his great picture in the palace of Westminster of the 'Meeting of Wellington and Blucher at Waterloo.'

FRESHWATER HERRING. See COREGONUS.

FRESHWATER MUSCLE, a popular name common to a whole family of lamellibranchiate molluscs, *Unionidæ* (sometimes called *Naiadæ*), allied to muscles (*Mytilidæ*), but having a much larger foot, which does not generally produce a Byssus (q. v.), except in a very young state of the animal. All the known molluscs of this family are inhabitants of fresh water, some of them being found in still, and some in running waters. A few species are European; but it is in North America that they chiefly abound, its lakes and rivers producing many species. They crawl about by means of the foot; many of them generally live immersed in mud. They are supposed to feed on animalcules, and on decomposed animal and vegetable matter. The epidermis of many is brilliantly coloured, and the inside of the shell is lined with a brilliantly and variously coloured nacre, so abundant as to be sometimes used for mother-of-pearl. Pearls are sometimes produced. There are four British species, of which one, *Anodon cygneus*, attaining a size of 2½ inches long by 6 broad, is common in lakes, ponds, and muddy rivers. It is very variable in the thickness of the shell and in other particulars. The hinge is toothless. Two species are confined chiefly to the south and east of England; the fourth (*Unio* or *Alasmodon margaritifera*, *Mya margaritifera* of Linnæus) inhabits the rivers of mountainous and hilly districts with a rocky bed, and has long been celebrated for the pearls which it produces. It is about 2½ inches long by 5 broad, and has a thick blackish-brown shell, with a toothed hinge. It is the most northern European species, and is found in the rivers of Norway and Sweden. The pearls of the British rivers were famous among the ancient Romans; and Suetonius represents them as having formed an inducement for Cæsar's expedition. Some of the rivers of Wales, the north-west of England and Scotland, have at various times produced beautiful and valuable pearls. In the river Earn, a tributary of the Tay, muscle-gathering is quite a trade, and the pearls found form the means of subsistence to many families. A pearl from the Conway, presented by Sir Richard Wynn to the queen of Charles II., is among the ornaments of the British crown. Large and fine pearls have also been procured from rivers of Tyrone and Donegal.



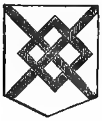
Freshwater Muscle (*Alasmodon margaritifera*).

FRESHWATER STRATA are so named from their supposed origin. This can be easily determined from an examination of the contained fossils.

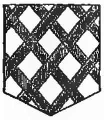
Though the great proportion of aqueous rocks are of marine origin, yet freshwater strata are occasionally met with. The yellow sandstones of the Old Red or Lower Carboniferous period are freshwater beds, as are also the Burdie-House limestone in the Edinburgh coal-field, the Purbeck beds in the Oolite, the Wealden beds in the Chalk, and the Hempstead and other beds in the Eocene period.

FRESNEL, Augustin Jean, a French physicist, was born at Broglie, in the department of Eure, 10th May 1788, educated at Caen at the Ecole Polytechnique, and finally at the Ecole des Ponts et Chaussées. On the completion of his studies, he was sent as government engineer to La Vendée, and afterwards to the department of Drôme, where he remained till March 1815. On the return of Napoleon from Elba, F. offered his services to the Bourbons, but ill health prevented him from actively engaging in military life. At the Restoration, he resumed his duties as government engineer; but in the interval he had been devoting his enforced leisure to physico-mathematical researches, particularly the polarisation of light, with so much success, that although in a letter, dated 28th December 1814, we find him writing to a friend to get him some books on the subject, as he did not know what the phrase 'polarisation of light meant' ('Je ne sais ce qu'on entend par la polarisation de la lumière'), yet before the completion of the following year, he ranked among the first authorities on the question. In ignorance, it is said of the labours of Young, F. demonstrated to his countrymen the error of the Newtonian theory of the propagation of light by the emission of material particles, and ably advocated the undulatory hypothesis. The result of his researches was exhibited in a memoir, crowned by the French Académie des Sciences in 1819. Along with Arago, he investigated the action exercised by polarised rays of light on each other, and their discoveries, published in a joint memoir, confirmed his previous theory on the mode of the propagation of light. His practical application of the new theory to the improvement of the light-house system, was of incalculable value, and has quite abolished the old method of illuminating light-houses. See Light-houses. In 1823, F. was elected a member of the Académie des Sciences; in 1825, a member of the Royal Society of London; and in 1827, received from the same Society the Rumford medal for his discoveries concerning light and heat. He died July 14, 1827.

FRET, a figure, in Heraldry, resembling two sticks laid saltierwise, and interlaced with a mascle.



Fret.



Fretty.

FRETTY. When six, eight, or more pieces are represented crossing and interlacing like lattice-work, the shield is said to be fretty.

FREYJA AND FRI'GGA, though spoken of in northern mythology as distinct, are originally one, and intimately associated with Freyr. Frigga, in the genealogy of the Ases (q. v.), is the supreme goddess, wife of Odin, and one of the daughters of the giant Fiörgwyn, and presides over marriages. Freyja is the daughter of Niord, sister of Freyr, and goddess of love. She is drawn on a car yoked with cats; to her, deceased women go, and also the half of those that fall in battle, whence she is called Val-Freyja. In this last respect, she must be considered as signifying the Earth; but the earth is also represented by Frigga, the wife of Odin, and when Freyja seeks Odin, as Isis seeks her Osiris, this is Odin conceived as the Sun. The names also, Frigga and Freyja, are in signification almost alike, and the two are often confounded in mythology. The Anglo-Saxons and Lombards worshipped the wife of Odin as Frea. The name yet survives in *Friday.*

FREYR, the son of Niord, of the dynasty of the Vanagods, was adopted with his father among the Ases, who, when he got his first tooth, bestowed upon him the celestial castle Alfheim. He is the god of peace and fertility; dispenses rain and fertility; and to him prayers for a good harvest are addressed. His wife is Gerda, daughter of the giant Gymer. F. had seen her as he once ascended the lofty seat of Odin, Hlidskialf, from which everything on earth is seen. Gerda was so beautiful, that the brightness of her naked arms illuminated air and sea. Seized with violent love, F. sent Skirnir as spokesman, and for his services had to give him his good sword, which he will miss in the great final contest or eclipse of the gods. Like Freyja, he was the patron of marriage, and probably the two were at one time conceived as united, hermaphrodite-wise. F. was held in great veneration, especially in Sweden, of which he was patron-god, and also in Iceland. His chief temple was at Upsala, where a bloody offering was yearly made to him of men and animals. His festival was at the winter solstice, the turn of the year—Yule-tide. While the god was borne round the land, all strife was laid aside. (Does 'the procession of the boar's-head,' at Christmas-time, commemorate F., who rode on the boar, Gullinbursti, and whose symbol was the boar's-head ?) The circumstance that the Saxon form of F.'s name, Fro, has been preserved in the German name of a Christian festival, Fronleichnam (Corpus Christi, the Lord's body), seems to shew that it had become among these peoples the abstract term for a god.

FREYTAG, Gustav, a dramatic poet and novelist of Germany, was born 13th July 1816, at Kreuzburg, in Silesia, studied at the universities of Breslau and Berlin, and took his degree in philosophy in 1838. His first important work was a comedy, entitled *Die Brautfahrt, oder Kunz von Rosen* (Breslau, 1844). Among his other productions may be mentioned *In Breslau* (Berlin, 1845), which is a collection of small poems written in a popular style; the dramas *Die Valentine* (Leip. 1847) and *Graf Waldemar* (Leip. 1848); and the comedy entitled *Die Journalisten* (1854); most of which were received with warm approbation on their appearance, and are remarkable for the care and refinement which they exhibit in the portraiture of character and the arrangement of incident. An edition of his dramatic works was published at Leipsic, in 3 vols., 1848—1850. But his greatest achievement in literature is undoubtedly *Soll und Haben* (Leip. 1855), a novel of German citizen-life, illustrating its activity, perseverance, and courageous loyalty, and thus expressing, as it were, the poetry of honest labour. It passed through five editions in one year, and a seventh was published at Leipsic, in 1858. It has been translated into English under the title of *Debit and Credit* (1858). In 1859, F. published a new classical drama, *Die Fabier*, a second edition of which has just appeared (Leip. 1862). His most recent work is a series of prose pictures from German history, entitled *Neue Bilder aus dem Leben des Deutschen Volkes* (Leip. 1862).

FRIAR, a name common to the members of certain religious orders in the Roman Catholic Church, and generally employed in contradistinction to the name Monk and Regular Clerk (see these articles). The name friar, although from its etymology (*frère*, brother) it belongs to the members of all religious brotherhoods, yet has come to be reserved almost exclusively for the brethren of the Mendicant orders. It is applied chiefly to the four great orders, Dominicans, Franciscans, Augustinians, Carmelites, and later, to the Trinitarians, and to the various branches of these orders. The Franciscans were properly denominated 'Friars Minor' (*Fratres Minores*). The Dominicans received, in contrast, the title 'Friars Major,' which, however, was perhaps rather a sobriquet than a serious name. These several bodies of friars, too, were popularly called, from the colour or other peculiarity of their habit, Grey Friars (Franciscans), Black Friars (Dominicans), White Friars (Carmelites) Crutched [or Crouched (*Cruciati*, 'crossed')] Friars (Trinitarians), so called from the cross which was embroidered upon their habit. This is the origin of the names of the several localities in London, and other towns thus designated, to the present day. In the orders to which we refer, the friars who are in priest's orders are styled 'father.' The other members are called simply 'brother.' The vow taken by friars at profession is of the class called in the Catholic Church 'solemn,' and is held to render null and void any contract of marriage entered into by the party subsequently to his religious profession.

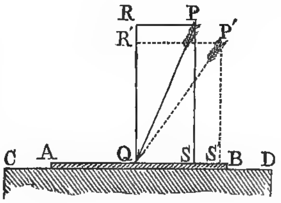
FRIARS' BALSAM. See BENZOIN.

FRI'CTION. When one body rubs against another as it moves, a certain force is felt to resist the motion. This resistance is called *friction.* As a considerable proportion of the motive-power in all operations is spent in overcoming the friction of the parts of the machine upon one another, and is thus lost for the useful work, it is of great importance to understand the nature of this obstructive force, with a view to reduce it to the least possible amount. Accordingly, a great many careful experiments have been made on this subject, and the result is a number of precise and valuable facts or laws regarding friction, which are now considered certain and reliable. The more important may be thus stated and illustrated.

When a block of oak—say a cubic foot, which weighs about 60 lbs.—is placed on a horizontal table of cast iron, the two surfaces being flat and smooth, it requires a force of nearly $\frac{2}{5}$ the weight of the block, or 24 lbs., pulling horizontally, to make it slide along the table. This measures the friction between the two surfaces. Another block of the same size and shape laid on the same table, would require the same force to draw it; and if the two were laid side by side, and fastened together so as to become one block, it would evidently require double the force, or 48 lbs., to draw the double block; the amount of the friction being thus still $\frac{2}{5}$ of the weight, or of the pressure between the two surfaces. But suppose that, instead of being laid side by side, the second block were laid on the top of the first, what is to be expected? Here the weight is doubled as before, but the extent of rubbing surface remains unaltered; it would be natural, therefore, to expect that this would make a difference, and that, though the friction would, of course, be increased, the increase would be less than in the former case. Experiment, however, shews that there is no difference, and that the friction is just double in both cases. In short, the unexpected and important fact is established, that, *within certain limits, the friction of any two surfaces increases in proportion to the force with which they are pressed together, and is wholly independent of the extent of the surfaces in contact.*

The amount of friction between two bodies is thus a constant fraction or proportion of the force with which they are pressed against each other. This fraction differs for the different kinds of surfaces. Thus, between oak and cast iron, it is, as already stated, about $\frac{2}{5}$, or more exactly, ·38; for wrought iron on wrought iron (we speak at present of dry surfaces, without grease or unguent of any kind), it is ·44; for brass upon cast iron, ·22. This constant fraction (expressing the proportion between the pressure of two surfaces and their friction) is called the *coefficient of friction* for these two surfaces.

Another way of illustrating this law of friction is the following, which has an important bearing on the erection of structures, and on mechanics in general. Suppose a slab AB, in contact with another slab CD, of the same or of different material; and that a force PQ presses on AB obliquely. Let QR be the perpendicular to the two surfaces, and draw PR, PS parallel to AB and QR, thus resolving the force PQ into two forces, one, PS, pressing AB against CD, the other, PR or SQ, tending to make AB slide towards C. It will clearly depend upon the strength of friction between AB and CD, how far the force PQ may be made to decline from the perpendicular without actually causing the one body to slide on the other. Suppose that when the pushing force is brought into the position P′Q, AB is just ready to slip on CD, and that it is a case of oak upon iron; then, since P′S′ or R′Q is the force pressing the surfaces together, and P′R′ or S′Q the force tending to produce motion, P′R′ will be $\frac{2}{5}$ of R′Q. The angle P′QR′ is called *the limiting angle of resistance* of the two surfaces AB, CD; for so long as the direction of the pressure PQ is within that angle, the friction of the surfaces will sustain it; but if the obliquity is greater, the surfaces will slip. This is true, independently of the extent of the surfaces in contact; and also of the amount of the pressure; for the stability depends upon the proportion of PR to RQ, and that is the same, whatever is the length of PQ, so long as its inclination is the same.



If the slab CD were tilted up, so as to form an inclined plane, until AB were on the point of sliding, the angle of inclination would be found to be equal to the limiting angle of resistance RQP′.

Knowing the coefficient of friction of any two substances, their limiting angle of resistance is easily found. *Example.*—The coefficient of brick upon hard limestone is ·60; required the limiting angle. Take a line QR′ of any convenient length, raise a perpendicular R′P′ equal to $\frac{6}{10}$ of QR′, and join QP′; R′QP′ is the angle required: if measured, it would be found to be about 31°. In any structure, then, the obliquity of the thrust between two surfaces of these materials must always be considerably within this limit, in order to be safe.

The *friction of quiescence*, that is, the resistance to the commencement of motion, is greater than the resistance to its continuance; and the more so if the surfaces have been a considerable time in contact. But the slightest shock or jar is sufficient to destroy this cohesion, or whatever it is that constitutes the peculiar initial resistance; so that it is only the constant and regular friction of motion that is of much consequence in practice.

Friction is very much diminished by the use of grease or unguents. The coefficient of wrought iron upon oak, which, in the dry state, is ·49, is reduced by the application of water to ·26, and by dry soap to ·21. The result of experiments on this subject is stated to be, 'that with the unguents, hog's-lard and olive-oil, interposed in a continuous stratum between them, surfaces of wood on metal, wood on wood, metal on wood, and metal on metal (when in motion), have all of them very nearly the same coefficient of friction, the value of that coefficient being in all cases included between ·07 and ·08.' Tallow gives the same coefficient as the other unguents, except in the case of metals upon metals, in which the coefficient rises to ·10. In the case of wood on wood, black-lead is frequently employed for the same purpose.

The most important fact, perhaps, and one that could hardly have been anticipated before experiment, is, *that the friction of motion is wholly independent of the velocity of the motion.*

The resistance to the motion of a wheeled carriage proceeds from two sources; the friction of the axle, and the inequalities of the road. The resistance of friction to the turning of a shaft in its bearings, or of an axle in its box, has evidently the greater leverage, the thicker the journal or the axle is; the axles of wheels are accordingly made as small as is consistent with the required strength. The resistance that occurs between the circumference of the wheel and the road, constitutes what is called *rolling* friction. There are on all roads, to a greater or less extent, visible rigid prominences, such as small stones, in passing over which the wheel and the load resting on it have to be lifted up against gravity. But even were these wanting, the hardest road yields, and allows the wheel to sink to a certain depth below its surface; so that in front of the wheel there is always an eminence or obstacle, which it is at every instant surmounting and crushing down. This is the case even on iron rails, though of course to a much less extent than on any other road. Now, for overcoming this resistance, it can be shewn, on the principle of the lever, that a large wheel has the advantage over a small one; and by numerous experiments, the fact has been fully established, that on horizontal roads of uniform quality and material, *the traction varies directly as the load, and inversely as the radius of the wheel.*

The best direction of traction in a two-wheeled carriage is not parallel to the road, but at a slight inclination upward, in proportion to the depth to which the wheel sinks in the road.

On a perfectly good and level macadamised road, the traction of a cart is found to be $\frac{1}{30}$ of the load; that is, to draw a ton, the horse requires to pull with a force equal to 75 lbs. On a railway, the traction is reduced to $\frac{1}{280}$ of the load, or to 8 lbs. per ton.

While friction thus acts as an obstruction to motion, and wastes a portion of the motive-power, it has also important uses. It is, in fact, an indispensable condition, no less than gravity, in the stability of every structure, and in every mechanical motion on the earth's surface. How essential it is to our own movements, we experience when we try to walk on ice. Even on ice there is still considerable friction, so that one foot can be slightly advanced before the other; were it altogether annihilated, we could not stir a fraction of an inch, even supposing we could stand upright. Without friction, a ladder could not be planted against a wall, unless there were a hole in the ground to retain the foot. In short, no oblique pressure of any kind could be sustained. The advantage of railways consists chiefly in the diminution of friction; but were this diminution carried much further, there could be no motion whatever, at least by means of locomotives. Without considerable friction, the driving-wheels of the locomotive would slide round on the rails without advancing; and this sometimes happens, when particular states of the weather render the rails as if they were greased.

The force of friction is often directly employed in mechanics. It is used, for instance, to communicate motion by means of belts, chains, &c. It is the force that holds a knot. It is specially useful when a machine, with great momentum, has to be checked or arrested in its motion. The best example of this is the *break* used on railways. By means of a system of levers, blocks of wood are made to press against the circumferences of a number of the carriage-wheels; and thus the momentum of a train weighing hundreds of tons, and moving with a velocity of perhaps 50 miles an hour, is gradually destroyed in a wonderfully short space of time.

Friction-wheels are employed to diminish the friction of axles on their supports. Two wheels, of large circumference in proportion to their weight, are placed close together, parallel to each other, and so that the one seems to overlap the half of the other; in the notch thus formed by the upper circumferences of the wheels one end of the axle rests; a similar arrangement being made for the other end. The friction, which formerly acted directly on the axle, is by this arrangement referred to the axles of the friction-wheels, and is, by the laws of mechanics, reduced in the ratio of the circumference of the friction-wheel to the circumference of its axle. In order to render the friction of the friction-wheels themselves the least possible, they are made as light and as large as is practicable.

FRIE′DLAND, a small town of East Prussia, in the circle of Königsberg, situated on the left bank of the Alle, 26 miles south-east of Königsberg, in lat. 54° 26′ N. and long. 21° E. Pop. 2581, who are employed in linen-weaving. F. has been rendered famous by the victory obtained there by Napoleon, 14th June 1807, over the Russian forces under Bennigsen. The Russian general found himself unable to cope successfully with an army of 80,000 men, as his own force consisted of less than 50,000 horse and foot; and he was forced to retire after a disastrous battle. He fell back upon the town of Tilsit, on the Niemen, where the treaty between the French and Russian emperors and the king of Prussia, known as the treaty of Tilsit, was drawn up.—Friedland is also the name of a town in Bohemia, situated on the Wittig, near the Prussian border. It is the capital of a district or duchy of the same name, from which the famous Wallenstein (q. v.) took his title of Duke of Friedland. Pop. of the town, 4400.

FRIEDLAND, Valentin, generally called, from his birthplace, *Trotzendorf*, and indisputably the greatest educationist of his age, was a native of Upper Lusatia, and was born 14th February 1490. After the death of his father, in 1513, he went to Leipsic, where he studied under the celebrated Peter Mosellanus and Richard Crocus, acquiring among other things a knowledge of Greek. On the dawn of the Reformation, he proceeded to Wittenberg, where he formed a close intimacy with Luther and Melancthon, and learned Hebrew from a converted Jew. In 1523, he proceeded to Goldberg, in Silesia, as rector of the gymnasium there; left after four years, but returned in 1531, and exhibited the greatest energy in improving the organisation of the school. Success crowned his efforts. The gymnasium of

Goldberg acquired a rare celebrity. Not only from Silesia, but also from Poland, Lithuania, Austria, Bohemia, Hungary, and Transylvania, pupils sought it in great numbers. Often more than 1000 attended at a time, who all dwelt together in buildings set apart for the purpose, and were admirably superintended and drilled. F. had a most wonderful belief in the efficacy of knowledge, and, in particular, placed so high a value on clearness of thought and expression, that he was wont to affirm that only rogues were unintelligible, and that an obscure and confused diction was a sure sign of a knavish disposition. He died at Liegnitz, 26th April 1556. Compare Pinzger's *Valentin Friedland, genannt Trotzendorf* (Hirschberg, 1825).

FRIENDLY ISLANDS, as distinguished from the Fiji Islands (q. v.), generally reckoned a part of them, are otherwise styled the TONGA GROUP. They stretch in S. lat. from 18° to 23°, and in W. long. from 172° to 176°, and consist of about 32 greater, and 150 smaller islands, about 30 of which are inhabited. The great majority are of coral formation; but some are volcanic in their origin, and in Tofua there is an active volcano. The principal member of the archipelago is *Tongatabu* or *Sacred Tonga*, which contains about 7500 inhabitants, out of a total population of about 25,000. The F. I. were discovered by Tasman in 1643, but received their collective name from Cook. Both these navigators found the soil closely and highly cultivated, and the people apparently unprovided with arms. The climate is salubrious, but humid; earthquakes and hurricanes are frequent, but the former are not destructive. Among the products of the islands are yams, sweet-potatoes, bananas, cocoa-nuts, bread-fruit, sugar-cane, the *ti*, hog-plum, &c.; some corn also is grown. The Flora resembles that of the Fiji group; but the native animals are very few.

The F. I. were first visited by missionaries in 1797. In 1827 the work of evangelisation fell into the hands of the Wesleyan Methodists, and after a lengthened and perilous struggle with the savage paganism of the inhabitants, it was crowned with success. Almost all the islanders are now Christians; great numbers can speak English, and, in addition, have learned writing, arithmetic, and geography; while the females have been taught to sew. The various islands used to be governed by independent chiefs, but nearly the whole of them are now under the rule of one chief, called King George, who is not only a Christian, but a zealous preacher of the gospel.

FRIENDLY SOCIETIES. The uncertainties of human life and health, and the effects of these on the well-being of those who are dependent for their subsistence on human labour, are too manifest not to have arrested the attention of men in all ages, and to have taxed their ingenuity to guard against them. It is probable, therefore, that traces of some sort of institution, corresponding more or less closely to the friendly societies of modern Europe, might be found wherever mankind have not depended for their means of living on the spontaneous products of the soil. At all events, they had their prototypes in the cases, boxes, and chests, or kists—as they were called in Scotland as in Germany—of the guilds and corporations of medieval Europe; which were funds not only for maintaining the dignity and ministering to the conviviality of the members, but for providing for the aged and the sick. Mr Turner finds them in Anglo-Saxon England, and, like the other institutions connected with municipal life, they probably formed part of the legacy of the Romans to the Teutonic conquerors of Europe. Friendly societies are a form of mutual insurance, and, like all insurances, they depend on the principle of substituting the certainty which attends the fortunes of large numbers of men for the uncertainty which belongs to the fortune of each. The objects which friendly societies usually contemplate are the securing, in virtue of a small periodical payment during health and vigour, of a weekly sum during sickness, and of a pension after a certain age. In some respects, and for some cases, joining a friendly society is better than becoming a depositor in a savings-bank. Sickness may come before the savings are considerable; or, if considerable, they may be melted away by a long-continued sickness; but after the first weekly payment is made to a friendly society, the member is secure of succour, however long his illness may continue, besides, perhaps, other advantages. It is possible, on the other hand, that a difficulty may be experienced, in certain circumstances, in keeping up the weekly or other periodical payments required to secure the benefits of friendly societies.

It is to be regretted that, of this excellent class of institutions, many are founded upon erroneous principles, or rather upon no principles at all; and it often happens, therefore, that those who trust to them are disappointed, the funds falling short before all claims are satisfied. This was at one time not to be wondered at, as no proper calculations for friendly societies existed; but such is no longer the case, sound calculations being now attainable. Nevertheless, there is still a considerable number of obscure societies scattered throughout the country, proceeding altogether at random, and by which the labouring-classes are induced to misspend large sums. We trust that what we have now to state will be of some service in promoting the establishment of sound societies, and putting an end to such as are of a different kind.

One great mistake in the formation of friendly societies is to assume that each member should pay an equal sum, whatever his age may be. This is unjust to the younger members, who have a less chance of becoming burdensome to the funds than the middle-aged; and, indeed, there is a rising scale of probability of sickness throughout all the years of a man's life. The Highland Society found that, between twenty and thirty, men are liable, at an average, to be half a week indisposed per annum. Between thirty and forty, the average was about two-thirds of a week. At forty-six, it became a full week, at fifty-seven two weeks; at seventy, eleven weeks. Various other partial observations exist; but as it has been found that sickness varies more considerably than mortality with the salubrity of the localities inhabited and the occupations of the members, no absolute reliance can be placed on their results. All of them, however, agree in this, that *increase of years is attended by increased liability to sickness.* Now, a rightly constituted friendly society is bound to advert to this circumstance. To admit all ages at an equal payment, is clearly making the younger members pay for the elder, who should have entered at an earlier age, and been paying all along.

Another great error in the constitution of benefit societies is in making them for a year only. *Yearly societies*, as they are called, usually originate with some individual—often the keeper of a tavern—who advertises that a society will be formed in his house on a particular day. Applicants for admission pay one shilling as entry-money, which goes into the pocket of the originator of the scheme by way of rent. The objects are generally threefold—namely, a fund for sickness and funeral expenses, a deposit fund, and a loan bank. Towards the first, there is perhaps a weekly payment of two-pence, or more if necessary, together with the interest arising from the loan of money to the members. Towards the deposit fund, there is a payment ranging generally from sixpence to two shillings, the accumulations being received back when the society closes. The money deposited is employed in making loans to such of the members as desire such accommodation, within the amount of their several entire deposits for the year, one penny per pound per month being charged by way of interest. The surplus, if any, of the twopences and interest, after sick and funeral money, books, and other necessaries are paid, is divided amongst those members who may be clear of the books at the close of the society. Some such societies are formed by a spontaneous association of persons, who prefer renting a room for their meetings, and thus escape the temptations of a tavern; but none of them avoid the errors of an equality of payments for all ages, and the yearly dissolution. Should sickness befall any one towards the close of the year, he is left, when the society dissolves, quite unprovided for, because he cannot enter another society in a state of sickness. Considered as a deposit for savings, the yearly society is strikingly inferior to the savings-bank, in as far as the depositor cannot take out money without paying an exorbitant rate of interest. Finally, these societies are generally under the care of obscure persons, who can give no security for the funds placed in their hands, and who in many instances become bankrupt or abscond before the final reckoning. Yearly societies are, indeed, in every point of view a most objectionable class of institutions, to which working-people would never resort but for their ignorance and unwariness, and the temptations held out to allure them.

A well-constituted friendly society involves, in the first place, the principle of payments appropriate to particular ages, as no other plan can be considered equitable. It stands forth before the working-classes as a permanent institution, like the life-assurance societies of the middle and upper classes, and necessarily requires its members to consider the connection they form with it as an enduring one, because its grand aim is expressly to make provision, at one period of life, for contingencies which may arise at another—youth, in short, to endow old age. By a yearly society, a man is left at last no better than he was at first, as far as that society is concerned; but the proper friendly society contemplates his enjoying a comfortable and independent old age, from the results of his own well-bestowed earnings.

It is essential to the character of a proper benefit society that individuals be not admitted indiscriminately. To take in a person in bad health or of broken constitution, is unjust to those members who are healthy, because he is obviously more likely to be a speedy burden to the funds. Here, as in life-assurance societies, it is necessary to admit members only upon their shewing that they are of sound constitution and in the enjoyment of good health. And it may be well to grant no benefits until after the member has been a year in the society. By these means, men are induced to enter when they are hale and well, instead of postponing the step until they have a pressing need for assistance, when their endeavour to get into a benefit society becomes little else than a fraud.

Government has thought proper to lend its aid in the formation of friendly societies, though not compulsorily. An association of persons forming one, has the means of ascertaining the soundness of its principles, and also entitles itself to deposit funds in savings-banks, with the government security, and at not less than £3, 0*s.* 10*d.* per cent. per annum, by submitting the proposed rules to the barrister appointed to certify them, to whom a fee of a guinea is payable. Under the sanction of government, tables have been formed by Mr John Tidd Pratt, registrar of friendly societies in England, and by Dr Farr, the actuary of the English registrar-general—the former, together with useful instructions in the book-keeping of friendly societies, are embodied in the reports by Mr Pratt, printed by order of the House of Commons for the years 1856—1857; and the latter, together with a masterly essay on the mathematical treatment of the subject, are contained in the twelfth report of the registrar-general formerly referred to. On the imperative necessity of acting on correct tables for such a purpose, it would be superfluous to dwell; and the necessity of identifying the rates of any society with such responsible authority is the more apparent, as we are told by Mr Pratt that the 'duty of the registrar, in examining the rules of a friendly society, is confined to the consideration of their being in accordance with law and the provisions of the acts in force relating to such an institution; and that, although the registrar certifies to the *legality* of the rules of a friendly society, it does not follow as a necessary consequence that the constitution of the society is based on good principles, or that the rates of payment are sufficient in amount to guarantee the promised benefits and allowances.' Before quoting any of these tables, we shall endeavour to explain how they are formed.

We have an idea of a benefit society in its simplest form, if we suppose a hundred men, of exactly 33 years of age, to associate, and make such a payment at first as may be sure to afford each man that shall fall sick during the ensuing year one shilling a day during the term of his sickness. Taking, for the sake of illustration, the Scottish Tables, we find that, amongst such a body of men, there will be about 66 weeks of illness in the course of the year. This, multiplied by 7, gives the whole sum required, £23, 2*s.*, or a little more than 4*s.* 6*d.* each, which, less by a small sum for interest, will accordingly be the entry-money of each man. A society of individuals of different ages, each paying the sum which would in like manner be found proper to his age, would be quite as sound in principle as one on the above simple scheme. It is only a step further to equalise each man's annual payments over the whole period during which he undertakes to be a paying member.

A point for consideration, however, is the rate at which the funds of the society may be improved. In most cases, we believe, it is best for such societies to rest content with taking advantage of the privilege which they enjoy by act of parliament, of depositing their money in the funds or the savings-banks, in which case they are sure to obtain for it interest at a rate of not less than £3, 0*s.* 10*d.* per cent. per annum.

Proceeding upon these or nearly similar grounds of calculation, Dr Farr suggests the following plan for insuring lives and granting pensions to the classes who live on wages, by combining the provision for insurance payable in a sum at death, and for annuity to begin at the age of 65. This union deprives the two operations of their chief risks, and there is little loss by the lives being better or worse than the average. The policies of insurance and annuities can be easily valued every year. It would be necessary to add a little to the premiums for expense of management and for fluctuation in interest and values of public securities. The plan is so constructed that the annual premium is invariable, that depositors can at any time discontinue their premium and withdraw their deposits, without invalidating or diminishing the amount of their policy, or that they can leave the sum in the guarantee fund as an insurance, to a certain extent, on their lives—a great advantage to persons of uncertain life-incomes. The table is calculated for 3 per cent. interest on the deposits. Proprietary and mutual life-offices add 19—40 per cent. to the calculated premiums for profits, expenses, and bonuses; and Dr Farr proposes to add one-fifth—that is, 20 per cent. for a like reason.

Dr Farr's Plan to insure the Lives and grant Pensions to the Working-classes.

Age 20 { Annual Premium to insure the Life, ... £1 } To be discontinued
Annual Premium to provide a Life-annuity, ... £1 } at the age of 65.

No. of Years or Premiums Paid.	Sum of Annual Premiums paid.		Sums in Deposit.		After the Premiums in columns 2 and 3 are paid, the Depositor is insured in the following.	
	For Annuity.	For Assurance.	On Annuity Account.	On Insurance Account.	Sums at Death.	Deferred Annuity, to begin at Age 65.
	£	£	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1	1	1	1 0 0	1 0 0	2 16 9	0 17 5
5	5	5	5 8 0	5 3 2	13 15 4	4 0 11
10	10	10	11 19 3	10 14 10	26 10 1	7 7 8
15	15	15	20 0 1	16 16 3	38 5 2	10 2 8
20	20	20	29 19 7	23 8 8	49 1 10	12 7 7
25	25	25	42 11 6	30 13 0	59 1 1	14 4 0
30	30	30	58 16 11	38 10 1	68 4 5	15 13 2
35	35	35	80 10 0	47 1 4	76 12 11	16 16 3
40	40	40	110 17 1	56 6 7	84 7 9	17 14 2
45	45	45	159 1 9	65 15 11	91 11 0	18 7 5
No further premiums paid.			Diminishing.	Increasing.	Sum insured at death remains constant.	Payment of Annuity commences.

The table reads thus: A person commencing at the age of 20, pays £2 a year until he is 64, and then pays the last premium. He will, at the age of 65, having paid 45 premiums, receive £18, 7*s.* 5*d.*, also the same sum annually for the rest of his life. At his death, his relatives or representatives will be entitled to £91, 11*s.*

Should he wish to discontinue the annual premium on the *insurance account at any time*, the sixth column shews his position from that time; thus, after the fifteenth premium is paid, his life will stand insured to the amount against 15 in column 1—namely, £38, 5*s.* 2*d.*, the amount in deposit at that time being £16, 16*s.* 3*d.*, which is the *present value* of his interest in the scheme, and which he may be allowed to withdraw, subject to any conditional by-law of the society.

In like manner, the annual premium in the annuity account may be discontinued, and the deposit withdrawn. Thus the same member having paid 15 premiums of £1, is secured in an annuity of £10, 2*s.* 8*d.* per annum, commencing at the age of 65, as before, the present value thereof in deposit on his account being, per column 4 of table, £20, 0*s.* 1*d.*

The importance is evident of commencing the insurance at an early age, and of combining the insurance with a deferred annuity. On both the insurance and annuity account, the premiums may be doubled or trebled, and in that case will provide double or treble the sum insured, as well as double or treble the annuity. With equal premiums, the amount in deposit on the two accounts is little less at the outset than the sum insured, and in a few years exceeds it.

For those who find occasion to go deeper into the subject of friendly societies, with a view to founding such institutions, we would recommend, in addition to the works already mentioned, a careful perusal of that which Mr Charles Ansell prepared for the Society for the Diffusion of Useful Knowledge, and which was published by that society in 1835. Much benefit might also be derived from Mr William Fraser's papers on Friendly Societies, published in Professor Jameson's *Philosophical Journal* in 1827.

The importance of friendly societies came to be so strongly felt in this country, that in 1793 they were made an object of statutory protection and regulation, and very numerous enactments have since been passed regarding them. In 1855, the whole of the subsisting legislation regarding them was repealed and consolidated by 18 and 19 Vict. c. 63. By this act, three registrars are appointed, one for England, and one for Ireland, both to be barristers, and one for Scotland, to be an advocate; all of not less than seven years' standing. The salary of the English registrar is £800, and those of the Scotch and Irish registrars £150 respectively. Under the provisions of the act, any number of persons may establish a friendly society, by subscriptions or donations, for the following objects. '1. For insuring a sum of money to be paid on the birth of a member's child, or on the death of a member, or for the funeral expenses of the wife or child of a member. 2. For the relief or maintenance of the members, their husbands, wives, children, brothers or sisters, nephews or nieces, in old age, sickness, or widowhood, or the endowment of members, or nominees of members, at any age. 3. For any purpose which shall be authorised by one of her Majesty's principal secretaries of state, or in Scotland by the Lord Advocate, as a purpose to which the powers and facilities of this act ought to be extended: provided that no member shall subscribe or contract for an annuity exceeding thirty pounds *per annum*, or a sum payable on death, or on any other contingency, exceeding two hundred pounds.' The rules of the proposed society must be transmitted to the registrar, whose certificate to the effect that it is in conformity with law shall constitute it an established society from the date of said certificate. No money is to be paid on the death of a child, without a copy of entry of the registrar of deaths; and by the subsequent act, 21 and 22 Vict. c. 101, s. 2, it is further provided, no payment shall be made on an insurance on the death of a child under ten years of age, for funeral expenses, without a certificate, signed by a qualified medical practitioner, stating the probable cause of death. The sums payable for the funeral expenses of a child under five are not to exceed £6, or for a child above five and under ten, £10.

FRIENDS, SOCIETY OF, the proper designation of a sect of Christians, better known to the general community by the name of Quakers. Their founder was George Fox (q. v.), born at Drayton, in Leicestershire, in 1624, who at first followed the occupation of a shoemaker, but afterwards devoted himself to the propagation of what he regarded as a more spiritual form of Christianity than prevailed in his day. In spite of severe and cruel persecutions, the Society of F. succeeded in establishing themselves both in England and America. They have, indeed, never been numerically powerful (having at no time exceeded 200,000 members); but the purity of life which from the beginning has so honourably distinguished them as a class, has unquestionably exercised a salutary influence on the public at large; while in respect to certain great questions affecting the interests of mankind, such as *war* and *slavery*, they have, beyond all doubt, originated opinions and tendencies which, whether sound or erroneous, are no longer confined to themselves, but have widely leavened the mind of Christendom. For an account of the more eminent representatives of the Friends, see the biographies of BARCLAY, FOX, PENN, &c. We confine ourselves here to a brief notice of their doctrine, practice, and discipline, as it is laid down in their own publications.

1. *Doctrine.*—It is perhaps more in the *spirit* than in the *letter* of their faith that the Society of F. differ from other orthodox Christians. They themselves assert their belief in the great fundamental facts of Christianity, and even in the substantial identity of most of the doctrinal opinions which they hold with those of other evangelical denominations. The Epistle addressed by George Fox and other Friends to the governor of Barbadoes, in 1673, contains a confession of faith not differing materially from the so-called Apostles' Creed, except that it is more copiously worded, and dwells with great diffuseness on the internal work of Christ. The Declaration of Christian Doctrine given forth on behalf of the Society in 1693, expresses a belief in what is usually termed the Trinity, in the atonement made by Christ for sin, in the resurrection from the dead, and in the doctrine of a final and eternal judgment; and the Declaratory Minute of the yearly meeting in 1829 asserts the inspiration and divine authority of the Old and New Testament, the depravity of human nature consequent on the fall of Adam, and other characteristic doctrines of Christian orthodoxy, adding: 'Our religious Society, from its earliest establishment to the present day, has received these most important doctrines of Holy Scripture in their plain and obvious acceptation.' It is nevertheless certain that uniformity of theological opinion cannot be predicated of the Friends, any more than of other bodies of Christians. As early as 1668, William Penn and George Whitehead held a public discussion with a clergyman of the English Church, named Vincent, in which they maintained that the doctrine of a tri-personal God, as held by that church, was not found in the Scriptures, though in what form they accepted the doctrine themselves does not appear; and some time later, Penn published a work himself, entitled the *Sandy Foundation Shaken*, in which, among other things, he endeavoured to shew that the doctrines of vicarious atonement and of imputed righteousness did not rest on any scriptural foundation. But in general, the Society of F., in the expression of their belief, have avoided the technical phraseology of other Christian churches, restricting themselves with commendable modesty to the words of Scripture itself, as far as that is possible, and avoiding, in particular, the knotty points of Calvinistic divinity (see Barclay's *Catechism and Confession of Faith*, published in 1673, where the answers to the questions—to avoid theological dogmatism—are taken from the Bible itself). This habit of allowing to each individual the full freedom of the Scriptures, has, of course, rendered it all the more difficult to ascertain to what extent individual minds, among the Society, may have differed in their mode of apprehending and dogmatically explaining the facts of Christianity. Their principal distinguishing doctrine is that of the 'Light of Christ in man,' on which many of their outward peculiarities, as a religious body, are grounded. The doctrine of the internal light is founded on the view of Christ given by St John, who, in the first chapter of his gospel, describes Christ—the Eternal Logos—as the 'life' and 'light of men,' 'the true light,' 'the light that lighteth every man that cometh into the world,' &c. Barclay taught that even the heathen were illumined by this light, though they might not know—as, indeed, those who lived before Christ *could* not know—the historical Jesus in whom Christians believe. In their case, Christ was the light shining in darkness, though the darkness comprehended it not. The existence of 'natural virtue' (as orthodox theologians term it) among the heathen was denied by Barclay, who regarded all such virtue as Christian in its essence, and as proceeding from the light of Christ shining through the darkness of pagan superstition. These opinions would seem to be somewhat freer than those expressed in the General Epistle of the Society published in 1836, wherein they refuse to acknowledge 'any principle of spiritual light, life, or holiness inherent by nature in the mind of man,' and again assert, that they 'believe in no principle whatsoever of spiritual light, life, or holiness, except the influence of the Holy Spirit of God bestowed on mankind in various measures and degrees through Jesus Christ our Lord;' but, on the other hand, in a little treatise published by the Society in 1861, it is affirmed that 'the Holy Spirit has always been afforded in various measures to mankind;' while stress is also laid on the statement of St Paul, that 'the grace of God (understood by Friends to signify the 'operation of the Divine Spirit') that bringeth salvation, *hath appeared to all men;*' while another exponent of their views, Mr T. Evans of Philadelphia (see *Cyclopædia of Religious Denominations*, Lond., Griffin & Co., 1853), states that 'God hath granted to all men, of whatsoever nation or country, a day or time of visitation, during which it is possible for them to partake of the benefits of Christ's death, and be saved. For this end, he hath communicated to every man a measure of the light of his own Son, a measure of grace or the Holy Spirit, by which he invites, calls, exhorts, and strives with every man, in order to save him; which light or grace, as it is received, and not resisted, works the salvation of all, even of those who are ignorant of Adam's fall, and of the death and sufferings of Christ; both by bringing them to a sense of their own misery, and to be sharers in the sufferings of Christ inwardly; and by making them partakers of his resurrection, in becoming holy, pure, and righteous, and recovered out of their sins.' Hence it may be safely asserted that they hold a broader (or, as others would say, a more latitudinarian) view of the Spirit's working than any other Christian church or society. In America, about the year 1827, Elias Hicks, a Friend of very remarkable powers, created a schism in the Society, by the promulgation of opinions denying the miraculous conception, divinity, and atonement of Christ, and also the authenticity and divine authority of the Holy Scriptures. About one-half of the society in America adopted the views of Hicks, and are known as Hicksite Friends; their opinions, of course, are repudiated by the rest of the Society, who may be described as Orthodox Friends. The Hicksite schism thoroughly alarmed the latter, both in England and America, and a movement was begun in favour of education, of a doctrinal belief more nearly allied to that of the so-called 'Evangelical' party, and of a relaxation in the formality and discipline of the Society. The leader of this movement was Joseph John Gurney, of Norwich. This

new tendency, however, excited considerable opposition among some of the Friends in America; and the consequence was a division among the Orthodox Friends themselves, and the formation of a new sect, called 'Wilburites,' after the name of their founder, John Wilbur, who are noted for the strictness with which they maintain the traditions and peculiarities of the Society. (See *Friendly Sketches in America*, by William Tallack. Lond., Bennett, 1862.) Some slight indications of theological differences have manifested themselves in England also.

2. *Practice.*—It is in the application of their leading doctrine of the 'internal light' that the peculiarities of the Friends are most apparent. Believing that it is the Holy Spirit, or the indwelling Christ, that alone maketh wise unto salvation, illumining the mind with true and spiritual knowledge of the deep things of God, they do not consider 'human learning' essential to a minister of the gospel, and look with distrust on the method adopted by other churches for obtaining such—viz., by formally training after a human fashion a body of youths chosen on no principle of inward fitness. They believe that the call to this work now, as of old, is 'not of men, neither by man, but by Jesus Christ, and God the Father;' and that it is bestowed irrespectively of rank, talent, learning, or sex. Consequently, they have no theological halls, professors of divinity, or classes for 'students.' Further, as fitness for the ministry is held to be a free gift of God through the Holy Spirit, so, they argue, it ought to be freely bestowed, in support of which they adduce the precept of the Saviour—'Freely ye have received, freely give;' hence those who minister among them are not paid for their labour of love, but, on the other hand, whenever such are engaged from home in the work of the gospel, they are, in the spirit of Christian love, freely entertained, and have all their wants supplied: in short, the Friends maintain the absolutely voluntary character of religious obligations, and that Christians should do all for love, and nothing for money. It also follows from their view of a call to the work of the ministry, that women may exhort as well as men, for the 'spirit of Christ' may move them as powerfully as the other sex. The prophecy of Joel as applied by Peter is cited as authority for the preaching of women: 'On my servants and on my handmaidens I will pour out in those days of my spirit, and they shall prophesy.' They also adduce the New Testament examples of Tryphæna, Tryphosa, the beloved Persis, and other women who appear to have laboured in the Gospel. Their mode of conducting public worship likewise illustrates the entireness of their dependence on the 'internal light.' In other religious bodies, the minister has a set *form* of worship, through which he must go, whether he feels devoutly disposed or not. This seems objectionable to the Friends, who meet and remain in silence until they believe themselves moved to speak by the Holy Ghost. Their prayers and praises are, for the most part, silent and inward. They prefer to make melody in their hearts unto God, considering such to be more spiritual than the outward service of the voice.

The doctrine of the 'internal light' has also led the Friends to reject the ordinances of Baptism and the Lord's Supper as these are observed by other Christians. They believe the Christian baptism to be a spiritual one, and not, like the Jewish and heathen baptisms, one with water; in support of which they quote, among other passages, the words of John the Baptist himself: 'I baptise you with water, but there cometh one after me who shall baptise you with the Holy Ghost and with fire.' Similarly do they regard the rite of the Eucharist: It is, say they, inward and spiritual, and consists not in any symbolic breaking of bread and drinking of wine, but in that daily communion with Christ through the Holy Spirit, and through the obedience of faith, by which the believer is nourished and strengthened. They believe that the last words of the dying Redeemer on the cross, 'It is finished,' announced the entire abolition of symbolic rites; that under the new spiritual dispensation then introduced, the necessity for such, as a means of arriving at truth, ceased, and that their place has been abundantly supplied by the Comforter, the Holy Ghost, whose office it now is to lead and guide men into all truth. The true Christian supper, according to them, is set forth in the Revelations—'Behold I stand at the door and knock: if any man hear my voice and open the door, I will come in unto him, and will sup with him and he with me.' For the same reason—viz., that the teaching of the Spirit is inward and spiritual—the Friends ignore the religious observance of days and times, with the exception of the Sabbath, which some at least among them regard as of perpetual obligation.

The taking or administering of oaths is regarded by Friends as inconsistent with the command of Christ, 'swear not at all,' and with the exhortation of the apostle James—'Above all things, my brethren, swear not, neither by heaven, neither by the earth, neither by any other oath: but let your yea be yea; and your nay, nay; lest ye fall into condemnation.' They have also refused to pay tithes for the maintenance of what they hold to be a hireling ministry, believing that Christ put an end to the priesthood and ceremonial usages instituted under the Mosaic dispensation, and that he substituted none in their place. In consequence, all consistent Friends have been regularly mulcted of plate, furniture, or other goods, to the value of the amount due. The recent conversion of tithe into *rent-charge*, however, has, in the opinion of many Friends, largely removed objections to the payment to this ecclesiastical demand. In regard to the civil magistracy, while they respect and honour it, as ordained of God, they are careful to warn the members of their Society against thoughtlessly incurring its responsibilities, involving as it does the administration of oaths, the issuing of orders and warrants in reference to ecclesiastical demands, the calling out of an armed force in cases of civil commotion, and other duties inconsistent with the peaceful principles of the Society. The Friends have likewise consistently protested against war in all its forms; and the Society has repeatedly advised its members against aiding and assisting in the conveyance of soldiers, their baggage, arms, ammunition, or military stores. They regard the profession of arms and fighting, not only as diametrically opposed to the general spirit of Christ, whose advent was sung by angels in these words: 'Glory to God in the highest, and on earth peace, good-will toward men;' but as positively forbidden by such precepts as—'Love your enemies, bless them that curse you, do good to them that hate you, and pray for them which despitefully use you and persecute you;' also, 'Resist not evil: but whosoever shall smite thee on thy right cheek, turn to him the other also;' and while they acknowledge that temporary calamities may result from adopting this principle of non-resistance, they have so strong a faith in its being essentially the dictate of divine love to the Christian heart, that they believe God, by his wise and omnipotent providence, could, and will yet make it 'mighty to the pulling down of the strongholds of iniquity.' The world, they believe, will by and by confess that the peace-makers are most truly the children of God. The efforts of the Society for the emancipation of the slaves are a part of modern British history. They may most certainly lay claim to having cultivated the moral sense of their fellow-countrymen in regard to this important question. As early as 1727, they commenced to 'censure' the traffic in slaves, as a practice 'neither commendable nor allowed,' and gradually warmed in their opposition, until the whole nation felt the glow, and entered with enthusiasm on the work of abolition. In respect to what may be called minor points, the Friends are also very scrupulous; they object to 'balls, gaming-places, horse-races, and playhouses, those nurseries of debauchery and wickedness, the burden and grief of the sober part of other societies as well as of our own.' The Printed Epistle of the yearly meeting of 1854 contains a warning against indulging in music, especially what goes by the name of 'sacred music,' and denounces musical exhibitions, such as oratorios, as essentially a 'profanation'—the tendency of these things being, it is alleged, 'to withdraw the soul from that quiet, humble, and retired frame in which prayer and praise may be truly offered with the spirit and with the understanding also.' They object, besides, to 'the hurtful tendency of reading plays, romances, novels, and other pernicious books;' and the yearly meeting of 1764 'recommends to every member of our Society to discourage and suppress the same.' A similar recommendation was issued by the Society in 1851 for the benefit of 'younger Friends' in particular, who would appear to have been eating the forbidden fruit. The Printed Epistle of the yearly meeting of 1724 likewise 'advises against imitating the vain custom of wearing or giving mourning, and all extravagant expenses about the interment of the dead,' and this advice has been repeatedly renewed. A multitude of other minute peculiarities, which it would be tedious to note, distinguish the Friends from their fellow-Christians.

3. *Discipline.*—By the term discipline the Friends understand 'all those arrangements and regulations which are instituted for the civil and religious benefit of a Christian church.' The necessity for such discipline soon began to make itself felt, and the result was the institution of certain meetings or assemblies. These are four in number: the first, the *Preparative* meetings; second, the *Monthly* meetings; third, the *Quarterly* meetings; and, fourth, the *Yearly* meetings. The first are usually composed of the members in any given place, in which there are generally two or more Friends of each sex, whose duty is to act as overseers of the meeting, taking cognizance of births, marriages, burials, removals, &c., the conduct of members, &c., and reporting thereon to the monthly meetings, to whom the executive department of the discipline is chiefly confided. The monthly meetings decide in cases of violation of discipline, and have the power of cutting off or disowning all who by their improper conduct, false doctrines, or other gross errors, bring reproach on the Society, although the accused have the right of appeal to the quarterly meetings, and from these again to the yearly, whose decisions are final. The monthly meetings are also empowered to approve and acknowledge ministers, as well as to appoint 'serious, discreet, and judicious Friends, who are not ministers, tenderly to encourage and help young ministers, and advise others, as they, in the wisdom of God, see occasion.' They also execute a variety of other important duties. The quarterly meetings are composed of several monthly meetings, and exercise a sort of general supervision over the latter, and from whom they receive reports, and to whom they give such advice and decisions as they think right. The yearly meeting consists of select or representative members of the quarterly meetings. Its function is to consider generally the entire condition of the Society in all its aspects. It receives in writing answers to questions it has previously addressed to the subordinate meetings, deliberates upon them, and legislates accordingly. To it exclusively the legislative power belongs. Though thus constituted somewhat according to Presbyterian order, yet any member of the Society may attend and take part in the proceedings.

Women have also a special sphere of discipline allotted to them: they inspect and relieve the wants of the poor of their own sex, take cognizance of proposals for marriage, deal with female delinquents privately, and under certain restrictions may even do so officially, though in the 'testimony of disownment' they have always the assistance of members of the other sex.

The Society of F., in the multitude of its regulations, has not forgotten the poor; charity in its narrower, as well as in its broader sense, has always been a beautiful feature of its members. The care of the poor was one of the earliest evidences which Christianity afforded to the Gentiles of the superiority and divine character of its principles; and it is honourable to the Society that a similar provision for those united to them in religious fellowship appears to have been one of the earliest occasions of their meetings for discipline. Nevertheless, in accordance with their ruling principle, that all Christian duty should be left for its fulfilment to the spontaneity of Christian love, and not performed under compulsion of any kind, 'the provision for the poor is purely voluntary; its only ground is Christian charity.' It is no small proof of the sincerity of their religious professions—considering the selfishness of human nature—that their liberality is a proverb throughout Britain and America.

Their number at present amounts, it is believed, to about 130,000, of which more than 100,000 belong to the United States.

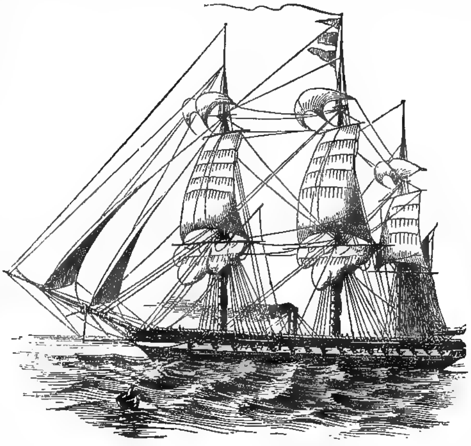
FRIES, Elias, a distinguished Swedish botanist, was born 15th August 1794, in the district of Femsjö, and studied at Lund, where he became demonstrator in botany in 1828. In 1834 he was translated to the university of Upsala, as professor of practical economics, with which, after the death of Professor Wahlenberg, in 1851, the chair of botany was conjoined. F.'s researches embrace the entire field of botany, *phanerogamous* as well as *cryptogamous* plants, and he was the first to introduce into Sweden the morphological theory, the basis of which is to be found in his *Systema Orbis Vegetabilis* (Lund, 1825). His earliest important work was *Observationes Mycologicæ* (2 vols., Copen. 1815—1818). This was followed by his *Systema Mycologicum* (3 vols. Greifsw. 1821—1829; Supplement, 1830), which was completed in his *Elenchus Fungorum* (2 vols. Greifsw. 1828), and later in his *Novæ Symbolæ Mycologicæ* (Upsala, 1851). For another department of cryptogamic botany, the lichens, F. has done great service by his *Lichenographia Europæa Reformata* (Lund and Greifsw. 1831). Among his monographs the *Symbolæ ad Historiam Hieraciorum* (Upsala, 1848), deserves especial mention. He has also written a good deal on the *Flora* of Scandinavia, and especially his *Summa Vegetabilium Scandinaviæ* (Upsala, 1846, *et. seq.*), is reckoned one of his best productions. His *Herbarium Normale* (Upsala, 1847), collected at great expense, and with incredible industry, contains dried specimens of all the rarest plants of Scandinavia. He has also composed a multitude of small dissertations on his favourite subjects, several of which have been translated into German. F. is greatly admired in his native country, and in 1851 was appointed director of the Botanical Museum and Garden attached to the university of Upsala, and in 1853 rector of the university.

FRIES, Jakob. Friedrich, the founder of a philosophic school in Germany, was born at Barby, in Prussian Saxony, 23d August 1773, studied at Leipsic and Jena, and in 1805 went to Heidelberg, as professor of philosophy and mathematics. In 1816 he accepted a call to the chair of speculative philosophy at Jena, but was deprived of his professorship, on account of his participation in certain democratic disturbances of 1819. In 1824, however, he was appointed to the chair of physics and mathematics, which he occupied till his death, 10th August 1843. F.'s writings are very numerous. Some of the more important are his *System der Philosophie als evidente Wissenschaft* (Leip. 1804); *Neue oder anthropologische Kritik der Vernunft* (3 vols. Heidelb. 1807; 2d ed., 1828—1831); *System der Logik* (Heidelb. 1811; 3d ed., 1837); *Handbuch der physischen Anthropologie* (2 vols., Jena, 1820—1821; 2d ed. 1837—1839); *Die Lehren der Liebe, des Glaubens, und der Hoffnung* (Heidelb. 1823); and *Geschichte der Philosophie* (2 vols. Halle, 1837—1840). In his philosophy, F. followed the method of Kant, but believing that method incomplete, he sought to supplement by an analytical nature-doctrine (*analytischen naturlehre*) of the human soul, which he designated philosophic anthropology. His *Glaubenslehre*, or Doctrine of Faith, by which he hoped to repair the ravages which the critical philosophy had made upon the certainty of our knowledge, resembles, in some respects, Jacobi's doctrine of the Intuition of the Pure Reason. De Wette adopted it as the basis of his religious philosophy. Some of his disciples, Apelt, Schleiden, Schlömilch, Friedrich Francke, and Schmidt, published at Leipsic in 1848—1849, several philosophic papers, entitled *Abhandlungen der Fries' schen Schule.*

FRIE'SLAND or **VRIESLAND** (ancient *Frisia*). West F., which is one of the most northern and wealthy provinces of Holland (q. v.), has an area of more than 1200 square miles, and a population which, in 1858, numbered 270,600. It lies between lat. 52° 40′ and 53° 30′ N., and long. 5° 30′ and 6° 20′ E., and is bounded to the N. by the German Ocean, and to the W. and S.W. by the Zuyderzee. The land, which is flat, and in some parts even below the level of the sea, is intersected by canals and streams in every direction, and abounds in lakes and marshes. The dykes, sluices, and canals, by means of which the country is protected from inundations of the sea, are under the supervision of a special board, which levies an assessment, called a dyke tax, on the land-owners of the province. The lakes and ponds, many of which have been formed by digging for turf, abound with fish; while the older marshes which have been redeemed and drained, form rich pastures, admirably suited to the rearing of horses, cattle, sheep, and pigs. From 4 to 5 million lbs. of cheese and butter are annually exported from F.; while it also yields in excess of its consumption, wheat, rye, flax, hemp, clover, &c. F. is amply endowed with schools and charitable institutions. The inhabitants are principally Calvinists. The chief town is Leeuwarden. The islands, Schiermonnikoog, Ameland, and Terschelling, which lie off the north coast, and are included in the province, carry on extensive fishing operations.—East F., which lies between 53° 8′ and 53° 40′ N. lat., and 6° 50′ and 8° E. long., with an area of 1000 square miles, and population (in 1858) of 189,068, is comprised within the Hanoverian district of Aurich, chief town, *Emden.* It is bounded on the N. by the German Ocean, W. by Holland, S. by Aremberg, and E. by Oldenburg. Like West F. it is low and flat, and requires the protection of dykes and sluices. Fishing and agriculture constitute the chief employment of the inhabitants, who are the descendants of the ancient Frisians. This province has frequently changed owners since 1744, when the family of Zirksena, in whose possession it had been for 300 years, became extinct. It was first ceded to Prussia, next incorporated by Napoleon with Holland and France; in 1814 it was restored to Prussia, but in the following year it was ceded by that power to Hanover.

FRIEZE, in classical architecture, the central portion of the entablature (q. v.). It is also called (by Vitruvius) the Zophorus (life-bearing) from its being frequently ornamented with sculpture. From the same cause, the term frieze is sometimes applied to any enriched horizontal band.

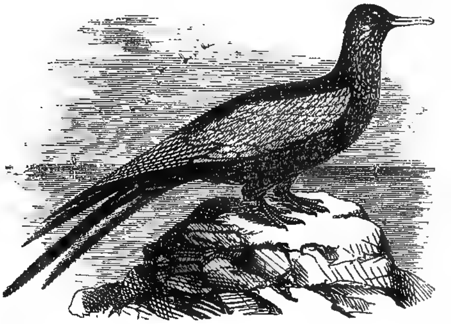
FRIGATE (probably connected with the Gothic *fargod*, a row-galley, and also with the Latin *aphractus*, an undecked galley). Formerly, a long narrow vessel propelled by oars and sails, used in the Mediterranean on occasions when speed was requisite. The name then came to be applied to men of war, of a class smaller than line-of-battle ships, and carrying from 20 to 50 guns, which were employed in the great wars of the 18th, and early part of the 19th centuries, as scouts and cruisers. The frigate was usually swift, easily managed, and capable of beating well up to the wind. She became, therefore, the favourite ship in war-time, and bore off a large proportion of the prize-money. Frigates also served to obtain information as to the movements of hostile fleets, and to guide the sailing of their own; but it was unusual for them to join in the line of battle, their exploits ordinarily occurring in engagements with single ships of their own class. One of Nelson's commonest complaints was, that he had not a larger number of swift frigates to intercept the enemy's cruisers; it having then been notorious that the French built faster and finer craft than those our dockyards could turn out, although it must be added, that most of these rapid frigates had changed their flag before the war closed.



Frigate—First Class, 50 guns.

With steam, and the growth of the fleet in recent times, frigates have been developed more than any other men-of-war, and many of the largest ships now in the navy belong to this class. The Americans set the example of enormous frigates in the *Niagara*, a pattern we have since far outrun in several splendid vessels, such as the *Diadem*, *Mersey*, *Orlando*, and last, the magnificent iron-plated *Warrior*, of 6000 tons, three times the burden of any ship in Nelson's fleet.

FRIGATE BIRD, or **MAN-OF-WAR BIRD**, *Tachypetes aquilus*, or *Fregata aquilus*, a bird of the Pelican family (*Pelecanidæ*), the only well-ascertained species of its genus, which is allied to the Cormorants. It is a large bird with black plumage, sometimes measuring ten feet—some say even fourteen feet—from tip to tip of its extended wings. It is a bird of very powerful and rapid flight, and there seems to be good reason for believing that it can remain on wing for days together. It inhabits the intertropical coasts, both of the Atlantic and Pacific Oceans, often flying out far to sea, but returning. Its aërial evolutions are extremely graceful, and it soars to a great elevation. It is said never to dive for its prey, but to seize fishes only when they appear at the surface or above it. Flying fishes constitute no small part of its food.



Frigate Bird (*Fregata aquilus*).

FRINGE TREE (*Chionanthus*), a genus of plants of the natural order *Oleaceæ*, consisting of small trees or large shrubs, natives of America, the West Indies, Ceylon, and New Holland. The Common Fringe tree or SNOWFLOWER (*C. Virginica*) is found in the United States from lat. 39° to the Gulf of Mexico. It sometimes attains the height of 20 or 30 feet, but is rarely more than 8 or 10, has opposite oval leaves 6 or 7 inches long, and very numerous snow-white flowers in panicled racemes. The limb of the corolla is divided into four long linear segments, whence the name fringe tree. The fruit is an oval drupe. The tree is frequently cultivated as an ornamental plant.

FRINGES. In optics, those coloured bands of diffraction (q. v.) which appear when a beam of light passes the clean edge of a screen, or is transmitted through a narrow slit or hole, are called fringes.

FRINGI'LLIDÆ, a family of birds of the order *Insessores*, tribe *Conirostres*, having a conical or nearly conical bill, sometimes short and thick, sometimes comparatively slender and elongated, sometimes convex above, below, or at the sides, the commissure—line of junction of the mandibles—straight. The neck is short, and neither the legs nor the wings are long. The Fringillidæ are all small birds; they feed chiefly on seeds—to some extent also on insects. The family is an extremely numerous one, and distributed over all parts of the world; represented in Britain by finches, linnets, sparrows, grosbeaks, crossbills, &c., and including also weaver-birds, bob-a-links, cardinal-birds, why-daws, tanagers, &c. Some naturalists extend its limits so as to include in it other groups, as buntings, larks, &c., often regarded as forming distinct families.

FRISCHES HAFF ('Fresh-water Bay'), a large lagoon on the coast of Prussia, south-east of the Gulf of Dantzic. It is rather less than 60 miles in length from north-east to south-west, with a breadth which varies in different parts from 4 to 12 miles, and an area of 318 square miles. It was once entirely walled off from the Baltic by the Frische Nehrung, a narrow spit of land extending for about 40 miles along its northern shore. In 1510, however, the waters of the F. H. broke over the Frische Nehrung, and formed the passage called the 'Gatt,' which unites this shore-lake with the Baltic. The Gatt is only from 10 to 15 feet in depth. All large vessels load and unload at Pillau, which is situated at the mouth of the Gatt, on the shore of the Gulf of Dantzig. Cargoes are conveyed to and from the ports on the F. H. by means of lighters. The Pregel, Frisching, Passarge, and two arms of the Vistula, fall into this lagoon.

FRI'SIANS. The Frisians (Lat. *Frisii*), were an ancient Teutonic race dwelling, together with the *Batavi*, the *Bructeri*, and the *Chauci*, in the extreme north-west of Germany, between the mouths of the Rhine and Ems. They became tributaries of Rome under Drusus, and for a time remained faithful to the Roman alliance; but, in 28 A.D., they were driven to hostilities by the oppression of their protectors; and although partially subdued, they again rose against the Romans under Civilis. As the Frankish tribes advanced further south, the Frisii spread themselves over the islands which are formed by the embouchures of the Rhine, the Maas, and the Scheldt, and gradually merged into the two branches of the *Frisii majores* and *Frisii minores*, the former occupying the districts west of the Fly or Zuyderzee, and the latter those east of those waters. In the 5th c., a band of the Frisii joined the Saxons and Angles in their invasion of Britain. At a later period, the Frisii of the south-west were brought under the Frankish rule by Pepin d'Heristal, who defeated their leader in 689, and compelled him and his people to embrace Christianity. In 785 the eastern branch of the tribe was brought under subjection by Charlemagne, who despatched Christian teachers to preach the Gospel to them, and who, in 802, defined their rights by the *Lex Frisionum*. Their country was divided into three parts, two of which were annexed, in the partition of the Carlovingian empire, to Louis the German, and constituted East Friesland, while the remainder, forming West Friesland, fell to the share of Charles the Bald. The latter of these provinces was subdivided in the 10th and 11th centuries into the hereditary countships of Holland, Zealand, Guelders cum Zutphen, and the bishopric of Utrecht cum Yssel; and hence the districts still retaining the name of Friesland have been circumscribed to their present limited boundaries, while the distinctive national characteristics of the F. have been obliterated by contact with their neighbours, and their history has merged in that of Holland and Hanover.

The *Frisian language* occupies a place intermediate, in some respects, between Anglo-Saxon and Old Norse. Of all the Teutonic dialects, it shews the closest affinities to English. There is a Frisian literature dating from the 12th century. Our knowledge of Old Frisian is derived from collections of laws, of which each 'Gau' had its own set written down in its own dialect. The *Asegabuch*, a set of laws valid for all Frisians, was composed about 1200. A complete collection of the Frisian laws still extant, was published by Richthofen

(*Fries. Rechtsquellen*, Gött. 1840). Since the 15th c., the Frisian has been encroached upon on all sides by the Dutch, the Low and High German, and the Danish; so that of the extensive area over which it once prevailed, it now subsists only in isolated spots, such as the islands of Wangeroge and Heligoland, the district about Leeuwarden, Molquerum, &c. This Modern Frisian is confined to the peasantry, and is not used in the schools or the churches. It is broken up into endless local dialects, each of which is unintelligible beyond the circumscribed district in which it is spoken. Several attempts have been made in the present century to revive the Frisian, by publishing some of the older specimens of its literature. Among these we may instance the *Friesche Rymlerye* of Gysbert Japicx (edited by Epkema, 1824); *Waatze Gribberts brilloft* (Leeuw. 1812); and *It Libben fen Aagtje Ysbrants* (Sneek, 1827). Hettema and the brothers Halbertsma are noted both for their original compositions in Frisian, and for their commentaries on Frisian jurisprudence. Among Frisian vocabularies, the best known are Wiarda's *Alt Fr. Wörterbuch* (1786); Richthofen's *Altfriesisches Wörterbuch* (1840), and N. Outzen's *Glossarium der F. Sprache* (Cop. 1837). J. Grimm and Rask have written on Frisian grammar, and the *Frisisk Sproglaere* of the latter has been translated into Dutch by Hettema (Leeuw. 1832).

FRIT (*Oscinis Frit*, or *Chlorops Frit*), an insect of the same family with the house-fly; an active greenish-black fly of the size of a large flea, which does great injury to barley crops in some parts of the north of Europe. It lays its eggs in the flowers, and its larvæ live on the young grains. Linnæus affirms that a tenth part of the barley in Sweden and Lapland is annually destroyed by it. It is not known in Britain, but is nearly allied to the insects called corn-fly and wheat-fly.

FRITH, or **FIRTH** (Lat. *fretum*, Gr. *porthmos;* from the same root as Ferry, q. v.), an arm or channel of the sea that is passed or crossed; the opening of a river into the sea.

FRITH, William Powell, R.A., an eminent English artist, the son of an innkeeper at Harrogate, Yorkshire, was born in that town in 1820. In 1840, he first exhibited, at the Royal Academy, London, a scene from Shakspeare's *Twelfth Night*, 'Malvolio before the Countess Olivia,' which at once attracted attention, as giving promise of future excellence. In 1841, his painting of the 'Parting Interview of Leicester and his Countess Amy,' from Scott's *Kenilworth*, evinced a marked improvement in his style and manner. Thenceforth he rose rapidly in public estimation, and his subsequent productions amply confirmed the high anticipations that had been formed of his skill and power. Among the paintings exhibited by him in successive years were the following: 'My Wife would bid both stand up to see which was the Tallest,' a scene from the *Vicar of Wakefield*, in 1842; 'Mrs Page, Mr Ford, Page, Slender, and Falstaff,' from the *Merry Wives of Windsor*, in 1843; 'English Merry-making a Hundred Years ago,' in 1847; 'An Old Woman Accused of Witchcraft in the Time of James I.,' in 1848; and 'Coming of Age,' in 1849; &c. F. was elected an Associate of the Academy in 1845, and a Royal Academician in 1853. In 1854, his 'Life at the Seaside' was one of the leading features of the Exhibition. 'The Derby Day,' exhibited in 1858, and 'Claude Duval,' in 1860, are considered two of the most successful of his performances. For the 'Railway Station' (1862), his latest, and probably his greatest painting, he is said to have received 8700 guineas. His occasional small portraits display, alike with his larger pieces, his complete mastery of his art.

FRI'THJOF'S SAGA, which was probably first written down at the end of the 13th or in the beginning of the 14th c., is an ancient Icelandic myth, which records the life and adventures of the hero Frithjof (properly *Fridhthjofr;* i. e., 'peace-destroyer,') who loved the beautiful Ingeborg, the daughter of a petty king of Norway. After being rejected by the brothers of Ingeborg, and having committed various acts of revenge on his enemies, he comes to the court of the old king Hring, to whom Ingeborg has been married, and is received with kindness. At the death of her husband, Ingeborg is married to her lover, who acquires with her hand the dominions of Hring, over which he rules prosperously to the end of his days. Frithjof is supposed to have lived in the 8th c.; but some writers assign to him a much earlier period. This Saga was included by Björner in his collection *Nordiska Kämpadater* (Stock. 1737); and by Rafu in his *Fornaldar Sögur Nordhrlanda* (Copen. 1829). Attention has of late years been more especially drawn to this ancient Saga, which is, in fact, merely one of a number of similar mythical narratives, in consequence of the distinguished Swedish poet, Bishop Tegner, having selected it for the groundwork of a poem (*Frithjof's Saga*), which was published in its complete form in 1825, and at once became the most popular poem that had ever appeared in Sweden, and raised its author to the height of his reputation. Tegner follows the Saga so closely, that the merits or demerits of the plan of the story must be ascribed more to the original than to himself; but to foreigners the poem scarcely seems to present the excellences that have been attributed to it by Swedish critics. The diversity of metre employed in the 24 cantos, of which each differs wholly from the others, detracts from the completeness of the whole, and produces an inharmonious effect. The *Frithjof's Saga* of Tegner has been translated into several other languages; among the five English translations, we may instance those by R. G. Latham (1838) and G. Stephens (1841).

FRI'TILLARY (*Fritillaria*), a genus of plants of the natural order *Liliaceæ*, herbaceous, bulbous-rooted, with bell-shaped perianth of six distinct segments, each having a conspicuous honey-pore

Crown Imperial (*Fritillaria imperialis*).

(nectary) at the base. About twenty species are known, natives of Europe and other temperate regions of the northern hemisphere. All of them have drooping flowers; some of them are beautiful. One species only is a native of Britain, the COMMON F. (*F. meleagris*), which is found in meadows and pastures in the east and south of England, flowering in April or May. The stem, about a foot high, bears several linear leaves, and in general only one flower, which is flesh-coloured, and marked with many dark spots. Many varieties are in cultivation.—This genus includes the CROWN IMPERIAL (*F. imperialis*), a native of Persia and the north of India, a well-known ornament of our gardens.

FRITILLARY, a name given to a number of species of butterfly, some of which are common in Britain, from the resemblance of the colouring of their wings to that of the petals of the common fritillary. This resemblance appears only on the upper side of the wings, the under side being often remarkable for metallic brilliancy.

FRIU'LI (Ger. *Friaul;* anc. *Forum Julii*), formerly the name of a district in the extreme north-east of Italy. It constituted one of the 36 duchies into which the Longobards divided the north of Italy. Its first duke is said to have been Graeulf (568—588 A. D.), nephew of the Longobardian King Alboin. It shared in all the incessant vicissitudes of the Lombard States during the middle ages. From an early period, F. was divided into *Tyrolese* and *Venetian* F., the former of which came into the possession of the Emperor Maximilian in 1500, while the latter remained attached to Venice till the peace of Campo-Formio (1797), when it was given to Austria. The inhabitants, called *Furlani*, are for the most part Italian, but make use of a peculiar dialect. The soil is fertile, and also rich in minerals and healing springs.

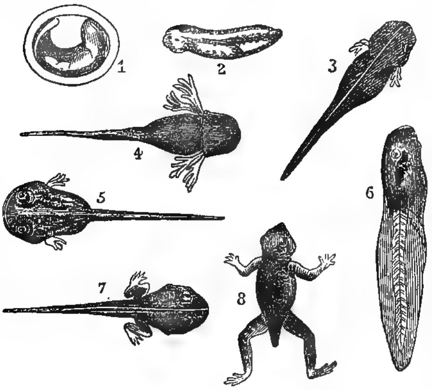
FRIVALDSZKY, EMRICH, a Hungarian naturalist, head-keeper of the National Museum of Hungary, was born in 1799 at Sâtoraljaujhely, in the county of Zemplĕn. In 1822, F. was admitted a member of the College of Physicians at Pesth, and soon afterwards appointed assistant-keeper in the department of natural history. F.'s investigations have lain in tracts hitherto little known to naturalists. His Monogram of the parallel between the Northern Carpathians and the alpine chain of the Lower Banat was presented to the Hungarian Academy in 1846. The sketches from the Natural History of the Olympus, of Asia Minor, &c., contain original views, and are distinguished for exactness. F.'s zeal for augmenting the natural treasures of the National Museum, and for the promotion of natural science in general, are known far beyond the boundaries of his native country.

FRIVOLOUS AND VEXATIOUS. By 9 Geo. IV. c. 22, s. 15, it was enacted, that if the Select Committee of the House of Commons, appointed to try a petition against an election, should be of opinion that any ground of objection stated against a voter was *frivolous* or *vexatious*, they should find the opposite party entitled to recover the full costs incurred by reason of such objection; and s. 40 provides, with reference to petitions in general, that the committee, at the time that they inform the House of their final determination on the petition, shall also report whether it did or did not appear to them to be frivolous or vexatious; and whether the opposition to it or the return was or was not vexatious or corrupt, in all which cases the parties frivolously petitioning or objecting are burdened with costs. The penalty of paying costs is likewise imposed by 5 and 6 Vict. c. 102, s. 15, on any one who shall bring forward a frivolous or vexatious charge of bribery. See ELECTION. Vexatious indictments for various crimes are prohibited by 22 and 23 Vict. c. 17, which provides that no indictment for the crimes therein mentioned shall be preferred without authorisation from one or other of the public officers therein mentioned. The statute does not extend to Scotland. As to frivolous and vexatious actions at law, see 3 and 4 Vict. c. 24, by which a portion of 43 Eliz. c. 6 is repealed; 4 and 5 Vict. c. 28, which again repeals a portion of 3 and 4 Vict. c. 24.

FROBISHER, SIR MARTIN, a distinguished naval adventurer of the Elizabethan period, the first Englishman who sought to discover a north-west passage to China, was a native of Doncaster, but the year of his birth is unknown. For many years, he in vain laboured to impress English merchants with an idea of the importance of a north-west passage; but at length, being patronised by some persons of rank and fortune, he succeeded in raising money enough to fit out two small vessels of 25 tons each, and a pinnace of ten tons. With these he sailed from Deptford on June 8, 1576, the queen, who was then at Greenwich, bidding them God speed on their venturous way by 'shaking her hand at them out of the window.' Steering their course north, they, in lat. 61° N., sighted the southern part of Greenland, which F. took to be the Friesland of Zeno, on the 11th July, to the east point of which F. gave the name of 'Queen Elizabeth's Foreland;' and on the 28th, they sighted *Meta Incognita.* On the 11th of August, F. entered the strait which bears his name, and which forms one of the entrances from Davis' Strait into Hudson's Bay. After about a fortnight's exploration of the coasts and islands, F.—having lost, through the treachery of the natives, a boat and five men—returned to England. He brought with him some ore picked up on one of the islands he discovered, in which some gold was found. Visions of immense wealth to be derived from further search in these northern lands floated before the eyes of the speculators of the time, who immediately fitted out another and better appointed expedition, giving the command to Frobisher. He sailed in May 1577, but his discoveries, hampered as he was by the gold-seeking operations, which turned out comparatively trifling, did not extend further than the neighbourhood of the strait he had before reached. A third expedition was sent out in the year following; but geographical science appears to have been but little benefited by it. F. afterwards served under Drake in the West Indies; and for his distinguished bravery in the fight with the Spanish Armada, July 26, 1588, he received the honour of knighthood. He afterwards commanded a squadron sent out to ravage the Spanish coast. He died on November 7, 1594, from the effects of a wound received while leading an attack by sea against Brest.

FROBISHER STRAIT, a passage between the west side of Davis' Strait and the north side of Hudson's Strait, is 140 miles long, with an average breadth of 20. It extends in lat. from 62° to 64° N., and in long. from 65° to 73° or 74° W. It is not of any practical value as a channel of communication; and, in fact, it has been very seldom visited by vessels bound either westward or eastward.

FROG (*Rana*), a genus of *Batrachia*, having in the adult state four legs and no tail, no gills, four toes on each of the fore-feet, five on each of the hind-feet, the feet more or less webbed; the head flat, the muzzle rounded; the mouth very large, a row of small teeth in the upper jaw, and an interrupted transverse row on the middle of the palate. The young (tadpoles) breathe by means of gills; external gills forming little fringes at the sides of the neck when they are very young, which, however, in a few days disappear; the gills, which remain until the tadpoles undergo their final metamorphosis into frogs, being very numerous minute crests attached to four cartilaginous arches on each side of the neck, in a cavity to which the water enters from the mouth, and from which it is expelled by one or two small orifices. Tadpoles have no legs, and the body tapers into a tail, and thus has a fish-like form, very different from that of the mature F., the tail being furnished with a membranous border like a fin. The mouth of the tadpole is a horny beak, which falls off when it becomes a frog. When this metamorphosis takes place, the hind-legs grow first, and afterwards the fore-legs begin to appear, the tail being gradually absorbed. Tadpoles are capable of living in water only; but the mature F. visits the water only occasionally, although generally capable of remaining long immersed, and always preferring moist places. In respiration, frogs draw in air through the nostrils, by movements of the muscles of the throat, and expel it by contraction of those of the lower part of the abdomen. The thin smooth skin of frogs is also believed to be subservient to the aëration of the blood. The skeleton is destitute of ribs. The eye is large and very beautiful. The colours are often pleasing, and the general aspect agreeable, in some species very much so, forming a strong contrast to the repulsive appearance presented by toads, notwithstanding the close affinity between them both in structure and habits. The greater proportionate length and strength of the hind-legs enables frogs to leap to a distance wonderful for creatures of their size, instead of crawling as toads do, and their activity and liveliness complete the contrast. The males have on each side of the neck a delicate membrane, which becomes inflated with air when they croak. The power of voice in the females is much inferior. The croaking of numerous frogs in marshy places, or around ponds and ditches, often makes an amusing and curious concert; but the powers of voice possessed by the frogs of Britain are not to be compared with those of the great Bull-frogs (q. v.) of North America; whilst the neighbourhood of Rio Janeiro is enlivened as night comes on by the Blacksmith F., which croaks so sonorously that the noise is like the clanging of a hammer on an anvil, the intermingled voices of some other kinds resembling the lowing of cattle at a distance; and in Peru, there is a F., of large dimensions, which has acquired the name of *Trapichero*, or Sugar-miller, because its voice has a grating sound like that produced by a sugar-mill. The confused blending of the voices of different species of frogs, in these countries, destroying the stillness of night, is one of the things most certain to arrest the attention of the stranger. In colder climates, frogs usually bury themselves in mud, and spend the winter in torpidity. In dry weather, they conceal themselves under shrubs and in tufts of herbage, from which rain quickly causes them to come forth, multitudes often appearing where not one was to be seen before. They feed chiefly on insects, slugs, &c. The beaks of tadpoles are adapted to the eating of leaves and other vegetable food, on which Cuvier says they entirely subsist; but the younger Buckland, in his *Curiosities of Natural History* (4th ed., Lond. 1859, pp. 2—4), in an amusing account of the habits of tadpoles, more correctly describes them as shewing a great avidity for animal food, crowding round a dead kitten, and nibbling at the toes of little boys who wade in pools where they abound. The spawn of frogs is a gelatinous mass, in which the eggs are contained, and which swells greatly by imbibing moisture. Impregnation takes place after it is deposited, as with the spawn of fishes.



Frog:
Successive stages—in the order of the numbers—from the egg almost to the perfect form.

The only species of F. certainly known to be British is that called in France the Red F. (*R. temporaria*), which is abundant in most parts of England and Scotland, but is said not to be truly indigenous to Ireland, and to have been introduced into that island in 1696. Its generally reddish colour, varied with black spots and patches, readily distinguishes it from the Green F. or Edible F. (*R. esculenta*) of the south of Europe—sometimes said also to have been found in Britain—which is olive green, with yellow stripes along the back, and generally larger than the red species. The south of Europe produces a number of other species, and they are generally more numerous in warmer climates. A remarkable peculiarity is exhibited by some frogs of tropical countries in a hornlike prominence above each eye. These have been separated into a new genus (*Ceratophris*). The Tree Frogs (q. v.), (*Hyla*), the most beautiful and interesting of all, have the extremities of the toes enlarged into a sort of cushion, secreting a viscid humour. Several other genera have been separated from the Linnæan genus *Rana*, but there is a strong family likeness among them all.

The use of frogs for food is generally regarded with disgust in Britain, but it is very common in some of the southern countries of Europe, and they are regarded as particularly delicate. The species chiefly used as food in Europe is the Green F. (*Rana esculenta*), already mentioned, which greatly abounds in ponds and slow streams in France, Southern Germany, and Italy. It feeds chiefly on insects, after which it darts with great agility on the banks, and may often be seen swimming with its head above water, or basking in the sunshine. Frogs are there taken for the market by nets, and by a kind of rake. In Vienna, they are kept and fattened in preserves adapted to the purpose. In France, the hind-quarters alone are prepared for the table; in Germany, all the muscular parts. They are dressed in various ways, and with various sauces, of which a great part often consists of wine.—The Grunting F. (*R. grunniens*) of the West Indies, a very large species, six or eight inches long, capable of leaping over a five-feet wall, is much used for food, its flesh being very white and delicate, and is often fattened for the table. It shews a considerable capacity for domestication, and readily becomes familiar.—A species of F. (*Pyxicephalus adspersus* of Dr Smith) is much used as food by the native tribes of South Africa. Dr Livingstone says the Bechuanas suppose it to fall from thunder-clouds, because the pools suddenly filled with water after a thunder-shower become instantly alive with loud-croaking frogs, which have previously been hidden in holes at the roots of bushes. This species is nearly six inches long, and when cooked resembles chicken.

FROG-BIT. See HYDROCHARIDEÆ.

FROG-FISH (*Batrachus*), a genus of fishes of the family *Lophiidæ*, to which also the Angler (q. v.) or Fishing Frog belongs. They are remarkable for excessive ugliness. The head is larger than the body; flattened, and spiny; the mouth is very large, with many teeth; the lips are often furnished with filaments; the pectoral fins are supported by a short stalk or wrist. The skin is naked in some species, scaly in others. The species are numerous and widely distributed, but none of them is British. They hide themselves in the sand to surprise their prey.

FROGGED, a term used in regard to uniforms, and applied to stripes or workings of braid or lace, as ornaments, mostly on the breast, on the plain cloth of which a coat is made.

FROISSART, JEAN, a French poet and historian, was born at Valenciennes, in the year 1337. Being destined for the church, he received a liberal education, but soon displayed a passion for poetry and the charms of knightly society. At the age of 20, he began to write a history of the wars of his time, and made several journeys to examine the theatre of the events he was about to relate. The composition of this work, which forms the first part of his Chronicles, occupied him about three years (1357—1360). On its completion, he went over to England, where he was received with great favour by Philippa of Hainault, wife of Edward III. In 1362, she appointed him clerk of her chapel and secretary. Two years afterwards, he visited Scotland, where he became the guest of King David Bruce, and also of William Earl of Douglas. Everywhere the gay, poetical, quick-witted, and shrewdly observant Frenchman was welcomed and honoured. In 1366, he accompanied the Black Prince to Aquitaine and Bordeaux. He afterwards went with the Duke of Clarence to Italy. F., along with Chaucer and Petrarch, was present at the marriage of this prince, at Milan, with the daughter of Galeazzo Visconti, and directed the festivities given by Amadeus VI., of Savoy, in honour of the duke. On the death of his protectress Philippa, F. gave up all connection with England, and, after many adventures, entered the service of Wenceslaus, Duke of Brabant, as private secretary. The duke was himself a poet, and F. made a collection of his verses, to which he added some of his own, and entitled the whole *Meliador, or the Knight of the Golden Sun.* On the death of Wenceslaus, he entered the service of Guy, Count of Blois, who encouraged him to continue his Chronicles. He now took a journey to the court of Gaston Phœbus, Count de Foix, that he might hear from the lips of the knights of Bearn and Gascony an account of their exploits. F. also made several other journeys, to collect information for his Chronicles. In 1394 he obtained the canonry and treasurership of the collegiate church of Chimay; in the following year visited England, where he was courteously and generously entertained by King Richard II.; and on his return spent the remainder of his life in completing his great work. He died at Chimay in 1410. F.'s Chronicles embrace the events occurring 1326—1400. They are valuable documents for illustrating the character and manners of his age. The pageantry of feudal times brightens his pages; the din of arms, the shouting of knights, and the marshalling of troops, is ever and anon heard; while 'visions of fair women' rise before us as we read. The gorgeous feasts and spectacles in which F. so much delighted are set forth in copious details; and though F. is no philosopher, his shrewd observations and richly minute descriptions have helped others to philosophise. F.'s Chronicles first appeared at Paris about the end of the 15th c., under the title of *Chroniques de France, d'Angleterre, d'Ecosse, d'Espagne, de Bretagne, de Gascogne, Flandres et lieux d'alentour.* The best edition is that of Buchon (15 vols., Par. 1824—1826). His poems have likewise been published by Buchon (Par. 1829). The beautiful MS. of the Chronicles in the library at Breslau was executed in 1468, and was secured to the town in a separate article, when Breslau capitulated to the French in the year 1806. The Chronicles have also been translated into Latin and several modern languages. England has two versions: one executed in 1523—1525 by Bourchier Lord Berners (reprinted in 1812); and the other in 1803—1805 by Thomas Johnes (reprinted by Bohn in 1845). The latter is the more exact; but the former, according to Sir Walter Scott, is the more artless and lively.

FROME, or **FROME SELWOOD**, a parliamentary and municipal borough, in the east of Somersetshire, on the Frome, a branch of the Avon, 12 miles south-south-east of Bath. The surrounding country is very picturesque, and the town, until modernised early in the present century by the formation of two wide thoroughfares, was a strange old place, with narrow, crooked, and steep streets and lanes, many of which still remain. It has manufactures of fine woollens, hats, silk, and cards for dressing woollen cloth. Pop. (1861) 9523. It returns one member to parliament. The once celebrated forest of Selwood was in the vicinity, and part of it, within the parish, remains in its original state.

FROND, in Botany, a term often used to designate the leaves of cryptogamous plants. It was originally introduced as distinctive of organs in which the functions of stem and leaf are combined, and was applied to the leaves of palms, &c. The term *leaf* is now very generally used even as to mosses, ferns, &c., and the term *thallus* is employed as to lichens. In the case of many *Algæ*, the term F. is often used to designate the whole plant except its organs of reproduction.

FRONDE, the name given to a political faction in France during the minority of Louis XIV., which was hostile to the court and the prime minister, Mazarin, and caused great domestic troubles from the year 1648 to 1654. The grasping and despotic policy of Mazarin, to whom Anne of Austria, the queen-regent, had abandoned the reins of government, had given offence to all classes. The princes and nobles saw themselves excluded from all high offices in the state, and their place supplied by foreigners; the parliament was threatened in its political rights, and the people groaned under the burden of taxes and administrative abuses. Parliament, therefore, commenced a course of determined opposition, refusing to register the royal edicts, more especially the disgraceful financial measures. Although the young king, then only nine years old, was obliged by several 'Beds of Justice' (q.v.) to compel the registration of the edicts, and to forbid the opposition of the parliament, the latter did not on that account change its bearing towards the court. Mazarin, therefore, adopted violent measures. On the 26th August 1648, he ordered the president, Potier de Blancmenil, and the councillor, Peter Broussel, to be arrested. The people took up arms, dispersed the Swiss guard, and on the 27th August (*la journée des barricades*), erected barricades in the streets around the Palais Royal. The court now yielded, repealed several taxes, and promised a better administration of justice. This victory gave parliament courage; those members who continued to keep a sharp look-out on the court measures, and were styled by the adherents of Mazarin *frondeurs*—i. e., censurers (literally, 'slingers')—formed the majority. The court now resolved to suppress the movement, in which the populace of the capital had also taken part, by force of arms, and, on the 6th January 1649, removed secretly to St Germain, leaving Paris to be blockaded by the Prince of Condé with 7000 men. The parliament, whose cause was now publicly espoused by the Prince of Conti, the Dukes of Longueville, Beaufort, Orleans, Bouillon, Elbeuf, Vendôme, Nemours, the Cardinal De Retz, and the Maréchal de la Mothe, called upon the people to resist, and even negotiated with the stadtholder of the Netherlands for an auxiliary corps. In this critical position, the court, on the 11th March, concluded a compact at Ruel, in which both parties missed their object. After the return of the court to Paris in August, a new turn was given to the contest, the princes of the blood disputing the power with Mazarin. This, on the 18th January 1650, led to the sudden arrest of Condé, Longueville, and Conti. This arbitrary proceeding roused the provinces. Marshal Turenne assumed the title of lieutenant-general of the royal army for the liberation of the princes, united himself with the Archduke Leopold, and took several fortified towns, but was finally completely defeated by Mazarin's troops at Rhetel, on the 15th December. Mazarin returned in triumph to Paris, but found all parties against him, and his removal was insisted upon so urgently, that he was obliged to release the princes, and flee to the Netherlands. A disgraceful system of intrigue was now substituted for force of arms, which totally changed the position of parties, and converted the contest which had begun for the interests of the people into a court cabal. Turenne was gained over by the queen-regent, De Retz by Cardinal Mazarin, and Condé was obliged to flee for safety into Guienne. Meanwhile, Louis XIV., who had now attained his 14th year, endeavoured to induce the Prince of Condé to return; but the latter, mistrusting these overtures, repaired to Bordeaux in 1651, where he had many adherents, whence he commenced a regular war against the court, which might have had dangerous consequences, had not Turenne opposed the prince. On the 2d July 1652, an engagement took place between the two parties in the neighbourhood of Paris. Condé was on the eve of being defeated, when the gates of Paris were opened to him by the courage and zeal of his sister, the Duchess of Longueville, and thus a new turn was given to the contest. Paris itself, weary of these fruitless dissensions, now entered into negotiations with the court, demanding the final removal of Mazarin, who had meanwhile returned. This demand was complied with by Louis XIV., and a general amnesty proclaimed. Condé, who refused to enter into the compact, relying upon an army of 12,000 men placed at his disposal by Charles, Duke of Lorraine, quitted Paris on the 15th October 1652, and repaired to Champagne; and finally, finding no one disposed to take up arms in his cause, entered the Spanish service, for which he was declared a traitor. Soon after, Mazarin returned to Paris, and was again intrusted with the reins of government. Thus the royal power came forth victorious from this long contest, which, though it seemed to commence for the popular interests, gradually changed into a miserable party strife among the nobles. Compare Ste-Aulaire's *Histoire de la Fronde* (3 vols., Par. 1827).

FRONTI'NUS, SEX. JULIUS, a Roman author who flourished in the second half of the first century. In 75 A.D. he was sent to Britain as governor of that island, and obtained a great reputation by his conquest of the Silures, and his vigorous maintenance of the imperial authority. He appears to have been twice consul in the course of his life, and to have held several other important offices. He died about 105 A. D. Several works are attributed to F., only two of which are certainly genuine, the *Strategematicon*, a treatise on the Art of War, in four books; and the *De Aquæductibus Urbis Romæ*, in two. The best edition of the first is that of Oudendorp (reprinted with emendations in 1779); of the second, that of Dederich (Wesel, 1841). The *De Aquæductibus* is an important contribution to the history of architecture.

FRO'NTISPIECE, the name generally given to an engraved and decorated title-page of a volume, or an engraving placed opposite the title-page. The term is also sometimes used to denote the front or principal face of a building.

FRONTO, M. CORNELIUS, was born at Cirta, in Numidia, and came to Rome in the reign of the Emperor Hadrian, where he soon obtained a high reputation as a teacher of eloquence. Antoninus Pius intrusted to him the education of Marcus Aurelius and Lucius Verus, both of whom always retained the warmest admiration of their preceptor. F. gradually rose to the highest offices of the empire, became very wealthy, and died, it is thought, about 170 A. D. Until recently, nothing was known of F. as an author, except from a few fragments of a grammatical treatise (*De Differentiis Vocabulorum*); but in the year 1814, Angelo Mai discovered in the Ambrosian Library at Milan a palimpsest, which being deciphered, was found to contain a considerable number of F.'s letters with some short essays. These were published by Mai in 1815; and in the following year an edition was published at Berlin by Niebuhr, who wrote a critical preface, and also printed the commentaries of Buttmann and Heindorf. A few years afterwards, Mai found in the library of the Vatican at Rome another palimpsest containing more than 100 of F.'s letters. The result was a new edition of F. by Mai (Rome, 1823), embodying the new discoveries, which was republished at Celle in Germany (1832). The contents of these letters are on the whole unimportant, although they help to confirm the good opinion which history has formed of the Emperor Marcus Aurelius; and the style is vapid and declamatory.

FRO'SCHDORF (originally, *Crottendorf*), called by the French *Frohsdorf*, is the name of a village in Lower Austria, rather more than 30 miles from Vienna, and not far from the frontiers of Hungary, on the right bank of the river Leitha. It is celebrated for its splendid castle, which in recent times has acquired a kind of political importance, from having been after 1844 the residence of the Duchess of Angoulême and the rendezvous of the elder Bourbon party. After the death of the duchess it came into the possession of the Comte de Chambord (q. v.), who has greatly beautified the interior.

FROSINO'NE (the ancient *Frusino* of the Volscians) is a town of Italy, in the States of the

Church, built on the slope of a hill above the junction of the river Cossa with the Sacco, about 48 miles east-south-east of Rome, on the high-road between Rome and Naples. It is the capital of a delegation of the same name, which is notorious for brigandage. The only interesting edifices are the palace of the papal delegate and the remains of an ancient amphitheatre. The costumes of F. are among the most admired of Italy. Pop. about 8000.

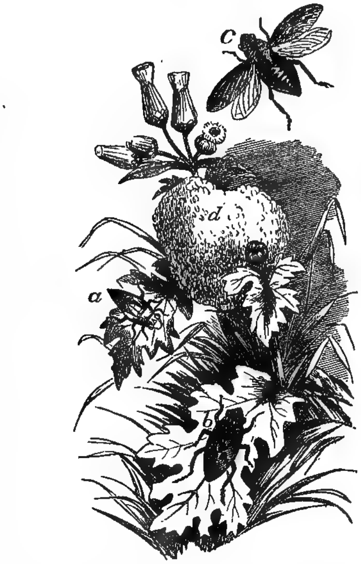
FROST-BITE is caused by cold depressing the vitality of a part or the whole of the body. The frost-bitten part is at first blue and puffy, from the current of blood through it being suspended; then, should the cold be continued, it becomes pallid, and the painful tingling gives place to numbness and insensibility, and finally to actual death or mortification. Although a sudden violent application of cold may cause death of the tissues, by reducing the temperature to a degree incompatible with animal life, the most common cause of the destructive effects of frost-bite is undoubtedly the excessive reaction which occurs on sudden removal of the cold, or the application of heat; this is especially the case with moist cold.

Baron Larrey believed that 'cold was merely the predisposing cause of frost-bite, and mentions that after the battle of Eylau the French soldiers did not experience any painful sensations during the severe cold varying from 10° to 15° below zero of Reaumur's thermometer; but when the temperature rose from 18° to 20°, they felt the first sensations of cold, and applied for succour, complaining of acute pains in their feet, and of numbness, heaviness, and prickings in the extremities. The parts were scarcely swollen, and of an obscure red colour. In some cases, a slight redness was perceptible about the roots of the toes, and on the back of the foot; in others, the toes were destitute of motion, sensibility, and warmth, being already black, and, as it were, dried.' Those of the men who indulged in the warmth of the bivouac fires suffered from frost-bite in much larger proportion than their more hardy comrades.

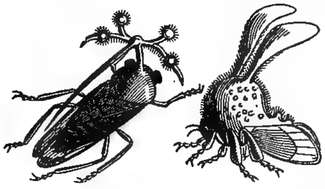
In this country, most cases of frost-bite are very trifling, the most common being Chilblains (q. v.). Occasionally, in severe winters, more severe cases present themselves at the hospitals in the persons of houseless, ill-nourished unfortunates, whose constitutions have in many instances been enfeebled by spirit-drinking.

The treatment of frost-bite consists in coaxing back by degrees the vitality of the part; this is most prudently effected by friction, at first with snow, then with water at ordinary temperature, no warmth being applied for some time. As the coldness subsides, the painful tingling returns, then redness and heat; in a short time, the latter will be above the natural standard, and if not moderated, the part will inflame, and perhaps mortify. It is well to remember that the part need not have been actually frozen for these symptoms to occur. The person with languid circulation who, coming home with cold wet feet, places them before the fire, or in warm water, may be 'frost-bitten' to all intents and purposes.

FROTH-FLY, FROTH-HOPPER, FROG-FLY, or FROG-HOPPER, the common names of those insects of which the young—larvæ and pupæ—are found in a frothy exudation on plants. They form the family *Cercopidæ* of the order *Homoptera*, and are allied to *Aphides*, and still more nearly to *Cicadas* and Lantern-flies. The larvæ and pupæ differ little in appearance from the perfect insect except that it possesses wings, which are four in number, and large. The frothy exudations in which they live are produced from the juices of the plants on which they are found; and as they are often in great numbers, crops of various kinds are not unfrequently destroyed or much injured by them, the plants being weakened by loss of sap. They have a proboscis adapted for piercing the bark of the plants on which they feed. They are all small insects. They have considerable leaping powers. *Cicada spumaria* is an extremely common species in Britain. The frothy exudation is sometimes called Cuckoo-spit, sometimes Frog-spittle, from fancies entertained as to its origin. It is sometimes so abundant, particularly on willow-trees, that persons walking beneath are wetted by its continual dropping. In tropical countries, the *Cercopidæ* are still more plentiful. Some of the tropical insects of this family are remarkable for their extraordinary forms, resulting from peculiar developments of the first segment of the thorax This is particularly the case in the genus *Bocydium*, of which two species are here figured.



Frog-Hopper (*Cicada spumaria*):
a, larva; *b*, perfect insect, with wing-covers closed; *c*, perfect insect, in the act of flight; *d*, the froth on a plant.



Bocydium Cruciatum. Bocydium Globulare.

FROUDE, James Anthony, an English historian, was born at Totness, in Devonshire, in the year 1818; studied at Oriel College, Oxford, where he took his degree in 1840; and in 1842 was elected a fellow of Exeter College. Having abandoned his original intention of entering the church, he published, in 1847, a volume of stories, entitled *The*

Shadows of the Clouds; and two years later, *The Nemesis of Faith,* a work in which the solemnity and sadness of religious scepticism are relieved by a singularly tender and earnest humanity. The book was written with great and even startling power, and not only cost F. his fellowship, but also a situation to which he had just been appointed in Tasmania. F., for the next few years, employed himself in writing for *Fraser's Magazine* and the *Westminster Review.* In 1856 appeared the first two vols. of his *History of England from the Fall of Wolsey to the Death of Elizabeth,* and in 1858 the third and fourth. The peculiarity of this work regarded as a *history,* consists in the use it makes of, and the value it places upon, the state documents of the time. The study of these documents has led F. to reverse not a few historical verdicts, especially that which has been passed upon Henry VIII.; but his decisions have by no means been generally, or even to any large extent, acquiesced in by other historical critics. The intellectual vigour and originality of the author's views and sentiments, and the mingled splendour and strength of his style, have, nevertheless, excited an extraordinary interest in the volumes.

FROZEN STRAIT, a passage, if passage it can be called, leading north-westward from Fox's Channel towards Repulse Bay. It separates Southampton Island, in the north of Hudson's Bay, from Melville Peninsula, which stretches northward to the strait of the Fury and Hecla. Its narrowness, for it is only fifteen miles wide, renders it, even in the 66th degree of latitude, almost constantly impervious to navigation.

FRUCTED. Trees when represented as bearing fruit are said heraldically to be fructed.

FRUCTIDOR (Eng. 'fruit-month') was the name given in the republican calendar of France to the period extending from the 18th of August to the 16th of September. The 18th Fructidor of the year 5 (or the 4th September 1797) is celebrated as the day on which Barras, Rewbel, and Lepaux, members of the Directory, by a *coup d'état,* saved the republic from the machinations of the Royalists, who had got the upper hand in the Council of Five Hundred. The execution of the *coup d'état* was intrusted to General Augereau.

FRUCTIFICA'TION (Lat. the producing of fruit), a term frequently employed in cryptogamic botany, sometimes to denote the whole reproductive system, and sometimes the fruit itself.

FRUCTOSE, or **FRUIT-SUGAR,** known also as INVERTED SUGAR, occurs in association with glucose, or (according to the recent investigations of Buignet) with cane-sugar in many ripe acidulous fruits. In its composition, and in most of its properties, it closely resembles glucose, from which, however, it differs (1), in being incapable of crystallisation; and (2), in its action on polarised light; while both glucose (or grape-sugar) and cane-sugar exert a right-handed rotation upon a ray of polarised light, this variety of sugar exerts a left-handed rotation; and hence the term *inverted* has been applied to it.

The composition of fructose is represented by the formula $C_{12}H_{12}O_{12}$. When boiled with dilute acids, fructose combines with the elements of water, and passes into glucose. A similar passage of this substance into glucose sometimes occurs spontaneously, as is seen in the gradual crystallisation of the sugar in dried fruits.

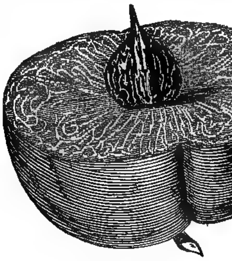
It appears to be procurable only from cane-sugar (or sucrose) by the action either of acids or of a peculiar albuminous ferment which exists in the juice of many ripening fruits.

FRUGO'NI, CARLO INNOCENZO, a much admired and versatile Italian poet, was born at Genoa in 1692, and educated for the church. In 1716 he began to teach rhetoric at Brescia, at which time he had already acquired the reputation of being an elegant writer of prose and verse, both in Latin and Italian. In 1719 he taught in Genoa, and subsequently at Bologna. At the court of Parma, through the patronage of the Cardinal Bentivoglio, he was appointed poet laureate, the stated and prescribed compositions of which post were highly uncongenial to his original and discursive muse; nevertheless the Dukes of Parma shewed particular favour to the poet, who returned to Genoa on the death of Duke Antonio, and the accession of the Spanish Infante. In 1733, Pope Clement XII. released F. from his spiritual vows, which had at all times been highly distasteful to him. A grand ode, in celebration of the capture of Oran by the Spaniards, and some other poetic addresses to the king and queen of Spain, reinstalled the poet in his former post at the Parmese court. He died in 1768. His numerous writings were published at Parma, 1779, and a complete edition at Lucca, 1779. A selection from his works appeared at Brescia, 1782.

FRUIT (*fructus*), in the botanical use of the term, in phanerogamous plants, is a mature ovary containing a seed or seeds; and in cryptogamous plants, a spore-case (*sporangium* or *theca*) containing spores. Other parts of the flower, most frequently the calyx, sometimes remain after flowering is over, undergo a further development, become incorporated with the ovary, and form part of the fruit. The development of the fruit in phanerogamous plants depends upon the fertilisation of the ovules, and when this has not taken place, the flow of sap to the ovary usually soon ceases, and it drops off with all the other remains of the flower; although there are exceptional cases of seedless fruits, as seedless oranges, bananas, grapes, barberries, &c., in which, however, it may be supposed that fertilisation takes place, and that unknown causes afterwards operate to prevent the development of the seed, and to direct the flow of sap more exclusively to the nourishment of the succulent parts, which are thus increased and improved. This supposition is rendered more probable by the circumstance that the production of seedless fruits appears to be at least sometimes a consequence of age and diminished vigour in trees.

The fruit, like the ovary, may be composed of one carpel, or of more than one. But the fruit sometimes differs from the ovary, through the development of some of the parts, and the non-development or obliteration of others; so that an ovary with several cells may be converted into a one-celled fruit; and of several ovules, all but one may become abortive, so as to produce a one-seeded fruit. Thus the three-celled ovary of the oak and of the hazel, with two ovules in each cell, becomes, by the non-development of two cells and five ovules, a fruit with one seed; and the two-celled ovary of the ash, and the three-celled ovary of the cocoa-nut, likewise produce one-celled and one-seeded fruits. Sometimes also false dissepiments are formed, which produce in the fruit a greater number of cells than existed in the ovary. More generally, however, the fruit agrees with the ovary in the number of its cells and seeds. But not unfrequently, the structure of the fruit is rendered comparatively difficult to determine, through the development of succulent matter or pulp, sometimes in one part and sometimes in another.

All that is external to the proper integuments of the seed in the ripe fruit is called the *pericarp* (Gr. *peri*, around; and *karpos*, fruit); and this, which varies extremely in size and other characters, usually consists of three layers, the outermost of which is called the *epicarp* (Gr. *epi*, upon); the middle one, the *mesocarp* (Gr. *mesos*, middle), or sometimes the *sarcocarp* (Gr. *sarx*, flesh); and the innermost, the *endocarp* (Gr. *endon*, within). These parts exhibit great variety, but it is generally the mesocarp which becomes succulent or fleshy, as in the peach, cherry, plum, and other drupes; and in the pear, apple, and other pomes. In drupes, or stone-fruits, the endocarp is the hard shell which immediately covers the seed; in pomes, it is the scaly lining of the seed-bearing cavities in the centre; in both drupes and pomes, the epicarp is the outer skin. So in melons, cucumbers, and gourds, the succulent part is the mesocarp, greatly developed, with a thin epicarp and a thinner endocarp. In the orange, however, and all of that family, the epicarp and mesocarp together form the rind, whilst the pulpy cells belong to the endocarp. In berries, as the gooseberry, grape, &c., the pulpy matter does not belong to any of the layers of the pericarp, but is formed from the placentas of the seeds.



Drupe (section of a Peach).

When the fruit, as the fully developed ovary, is considered as a modified leaf or leaves, the epicarp is viewed as representing the epidermis of the lower surface, the endocarp the epidermis of the upper surface, and the mesocarp the substance (*parenchyma*) of the leaf. The midrib of the leaf is traced in the *dorsal suture* of the fruit or of each component carpel, and the *ventral suture* is formed by its folding together and the conjunction of its edges. The dorsal and ventral sutures are very obvious in the pods of pease, beans, &c.; and even in fruits formed of several carpels intimately combined, they often become very apparent when the ripened fruit opens to allow the escape of the seeds. The opening or *dehiscence* (Lat. *dehisco*, to open) of fruits takes place in various ways; thus, the fruit sometimes resolves itself into its original carpels by separation through the *dissepiments*, which divide into two plates forming the sides of the valves, and the carpels further open by their sutures; the pericarp sometimes splits at once by the dorsal sutures of the carpels; sometimes it divides transversely, and throws off a lid; sometimes it opens more partially by pores, &c. Many fruits, however, are indehiscent, some of which are fruits having a very hard pericarp, as nuts, and some are fruits having a soft pericarp and much pulp. The decay of the pericarp is in these cases necessary to the liberation of the seeds, unless when this is accomplished by such means as the fruit becoming the food of animals, by which also the seeds of plants are often widely distributed. The decay of the pericarp seems intended, in many cases, to provide the first nourishment for the young plants which spring from the seeds.

A classification of the different kinds of fruits is extremely difficult, although they afford characters of great importance in descriptive and systematic botany. A convenient primary division of fruits is into those which are formed from one flower, and those which are formed by incorporation of the ovaries of many flowers. Fruits formed from one flower, by far the most numerous of these two classes, are divided into *apocarpous* and *syncarpous*, or into *apocarpous, aggregate*, and *syncarpous.* Apocarpous fruits are formed of one carpel, and are either dry or succulent, dehiscent or indehiscent, one-seeded or many-seeded. Aggregate fruits, sometimes included among the apocarpous, are formed of several or many free carpels; sometimes dry, sometimes succulent; sometimes arranged on a convex or elevated receptacle; which becomes succulent in the strawberry, and constitutes the edible part of the fruit; sometimes within a concave receptacle covered by the enlarged tube of the calyx, as in the rose. Syncarpous fruits are formed of several carpels, intimately united in their mature state, so as to form a berry, capsule, pome, silique, &c. Syncarpous fruits sometimes so completely resolve themselves into their original carpels, that these may be regarded as becoming separate achenia. Fruits formed by incorporation of the ovaries of many flowers (collective or anthocarpous fruits) are sometimes dry, as the cones of firs; sometimes succulent, as the pine-apple, the mulberry, and the fig. For further notice of different kinds of fruits, we must refer to particular articles in which they are described, as achenium, berry, capsule, drupe, nut, pome, pod, silique, &c., and to articles on the plants which produce them.

A few plants, particularly the *Coniferæ* and *Cycadaceæ*, produce seeds really naked or destitute of pericarp. Many other seeds were formerly often described as naked, in which the pericarp exists intimately incorporated with the seed, as the seeds of grasses, *Boragineæ, Labiatæ, Umbelliferæ*, &c. Their real nature is often made apparent by some trace of the style.

The production of ripe fruit is exhaustive to the energies of a plant, and plants ordinarily annual may be preserved in life for several years by preventing it. Very young fruit-trees generally fail to bring fruit to perfection, and the first flowers of melons and gourds are often, for a similar reason, abortive; whilst, on the contrary, any circumstance that favours an accumulation of sap in a particular season, tends to render fruit-trees unusually productive in the next, as when the whole blossoms of a year are killed by frost, or when, from the coldness of the previous summer, flower-buds have not been formed in abundance. Whilst the vital energies of a plant are directed mainly towards the increase of its size, flower-buds are sparingly formed or not at all, as is often the case with fruit-trees growing very luxuriantly, and various modes are adopted to cause the production of flower-buds and of fruit by checking this luxuriance of growth, as by root-pruning, by cutting into the stem of wall-trees to a moderate depth, or by taking off portions of the bark of the stem. Grafting (q. v.) is also of use in this respect, as well as for the propagation of improved varieties of fruit-trees, the qualities of which would, in all probability, not be found exactly the same in their offspring by seed.

In a very immature state, fruits are in general green and soft, and decompose carbonic acid gas in the sunlight, absorbing the carbon, and setting free the oxygen, like leaves and other green parts of plants. As they advance towards maturity, some of them become externally dry and hard, and cease to perform by their surface these functions of vegetation; others, as they become more succulent, change their colour, and instead of absorbing carbon and liberating oxygen, absorb oxygen from the atmosphere, and exhale carbonic acid.

It would not be easy to enumerate the peculiar substances which are produced in fruits. Different parts of the same fruit are often extremely different from one another, as the milk and the kernel of the cocoa-nut, its hard shell, and its fibrous husk. Seeds are indeed generally very different in all their qualities from the pericarp or the pulp by which they are surrounded, and the integuments of the seed often not less different from the embryo, of all which a ready illustration may be found in the apple or the grape. The most different chemical products of vegetation are sometimes to be found in different parts of the same fruit, giving them the most varied qualities, as wholesome and poisonous; the succulent part of the fruit, from the kernel of which strychnia is obtained, is said to be harmless, and the seeds of plums contain so much hydrocyanic acid, that to eat many of them would be dangerous; the capsule of the poppy yields opium, but its seed contains nothing of the kind, and is bland and nutritious, abounding in a wholesome fixed oil. The value of fruits to man—which may safely be asserted to exceed that of all other parts of plants—sometimes, as in the corn-plants, chiefly depends on the farinaceous matter of their seeds, containing starch, gluten, &c.; sometimes, as in the banana and bread-fruit, on the starchy matter of the pulpy part; sometimes, as in nuts, on fixed oils; sometimes, as in many succulent fruits, on sugar and various acids, with gum, pectine, &c. Other fruits, or parts of the same fruits, are valuable for the volatile oils which they yield, and for peculiar principles capable of application to medicinal and other uses, or making them capable of being used as condiments, perfumes, &c. Coffee, cocoa, pepper, vanilla, and many other articles of commerce, are obtained from fruits.

Whilst some fruits are of the highest value as articles of food, others are generally regarded rather as articles of luxury; yet the abundance of succulent fruits in tropical climates is a bountiful provision for real wants, contributing much to the health of the inhabitants. The coolness of succulent fruits renders them peculiarly grateful amidst the heat of the tropics; their temperature, when newly gathered, being much below that of the surrounding atmosphere.

Cultivated Fruits.—In its popular use, the term fruit sometimes has almost the same signification as in the language of botanical science; sometimes it is employed as almost exclusively designating the edible succulent fruits. We cannot attempt an enumeration of edible fruits; many will be found noticed in other botanical articles; we can only here observe that they belong to many and very different natural orders, both of endogenous and exogenous, but chiefly of exogenous plants. We propose, however, to conclude this article by an enumeration of the principal cultivated succulent fruits, including those which are important as articles of food or of commerce.

ENDOGENOUS PLANTS.

Musaceæ.	Plantain and Banana.
Bromeliaceæ.	Pine-apple.
Palmæ.	Date.

EXOGENOUS PLANTS.

Moraceæ.	Fig.
	Sycamore.
	Mulberry.
Artocarpaceæ.	Bread-fruit.
Lauraceæ.	Avocado Pear.
Solanaceæ.	Love-apple, or Tomato.
	Egg-plant.
Sapotaceæ.	Mammee Sapota.
	Sapodilla.
	Star-apple.
Ebenaceæ.	Date Plum.
	Kaki.
Oleaceæ.	Olive. [Differs very much in its nature and uses from all the other fruits here enumerated.]
Vacciniaceæ.	Cranberry.
Cornaceæ.	Cornel.
Myrtaceæ.	Rose-apple.
	Malay Apple.
	Ugni.
	Guava.
	Pomegranate.
Grossulariaceæ.	Gooseberry.
	Red (and White) Currant.
	Black Currant.
Cactaceæ.	Prickly Pear, or Indian Fig.
Cucurbitaceæ.	Melon.
	Water-melon.
	Cucumber.
	Pumpkin.
	Squash.
	Gourd.
Passifloraceæ.	Granadilla.
Papayaceæ.	Papaw.
Rosaceæ.	Apple.
	Pear.
	Quince.
	Medlar.
	Loquat.
	Peach and Nectarine.
	Apricot.
	Plum.
	Cherry.
	Raspberry.
	Strawberry.
Leguminosæ.	Tamarind.
Anacardiaceæ.	Cashew-apple.
	Mango.
	Hog-plum.
	Otaheite Apple.
Rhamnaceæ.	Jujube.
Oxalideæ.	Carambola.
Vitaceæ.	Grape.
Sapindaceæ.	Akee.
	Litchi.
	Longan.
	Rambutan.
	Honey Berry.
Malpighiaceæ.	Barbadoes Cherry.
Clusiaceæ.	Mammee Apple.
	Mangosteen.
Aurantiaceæ.	Orange.
	Lemon.
	Citron.
	Shaddock.
	Forbidden Fruit.
	Lime.
	Wampee.
	Marmelos.
Sterculiaceæ.	Durion.
Anonaceæ.	Custard Apple.

Nuts, and along with them some fruits, which although not botanically nuts, resemble them in qualities and uses, will be noticed in a separate article.

Chemical Composition of Fruits.—Our principal knowledge of the composition of different kinds of fruit is due to the recent investigations of Fresenius, which are published in the *Annalen der Chemie und Pharmacie* for 1857. In that memoir, he gives the results of upwards of fifty analyses of different fruits, including gooseberries, currants, strawberries, raspberries, mulberries, grapes, cherries, plums, apricots, peaches, apples, and pears. We select the following analyses as representing the composition of some of our most important fruits—viz., (1) the gooseberry; (2) the grape; (3) the cherry; (4) the peach; (5) the apple; and (6) the pear. For the purpose of comparison, the free acid which is present, whether it be malic, citric, or tartaric (all of which occur in fruits), is calculated as hydrated malic acid.

		1.	2.	3.	4.	5.	6.
	Water,	85·36	79·98	79·70	82·01	85·04	83·95
	Solid Constituents,	14·64	20·02	20·30	17·89	14·96	16·05
Soluble.	Glucose and Fruit-sugar,	7·51	13·78	10·70	1·53	7·58	7·00
	Free Acid,	1·33	1·02	0·56	0·77	1·04	0·07
	Albuminous Substances,	0·37	0·83	1·01	0·39	0·22	0·26
	Soluble Pectine, Gum, &c.,	2·11	0·50	0·67	9·28	2·72	3·28
	Soluble Mineral Constituents,	0·24	0·46	0·60	0·76	0·44	0·28
Insoluble.	Stone or Seeds,	2·08	2·59	5·73	3·21	0·38	0·39
	Skin and Cellulose,			0·37	0·94	1·42	3·42
	Pectose,	0·96	0·94	0·66	1·00	1·16	1·34
	Insoluble Mineral Constituents,	0·17	0·12	0·08	0·10	0·03	0·05

Glucose and fruit-sugar or fructose, are described in the articles devoted to these subjects. Under the heading 'Soluble Pectine, Gum, &c.,' are included colouring matters, fatty or oily matter in a state of suspension, and organic acids in combination with bases. We shall endeavour to explain briefly the nature of the substances designated in these analyses as pectine and pectose. The term *pectine matters* is applied to a very widely distributed class of substances occurring in the vegetable kingdom, and especially abundant in fleshy fruits and in roots, but whose properties and composition require further investigation. The substance termed *pectose*, which is insoluble in water, occurs in plants, which likewise possess a ferment in solution which converts pectose into *pectine*, which is soluble in water, and is the main constituents of apple and other fruit jellies. (According to Fremy, *pectic acid*, which is closely allied to pectine, is formed in fruits that yield jellies: he has assigned formulas to both these substances, but they are not generally accepted.)

The ratio in which the free acid stands to the sugar varies extremely. For a unit of free acid, the sugar is represented by 1·63 in plums, by 3·00 in currants, by 4·37 in strawberries, by 4·93 in gooseberries, by 7·03 in damsons, by 11·16 in apples, by 17·29 in sweet cherries, by 20·18 in grapes, and by 94·60 in pears; the percentage of sugar is least (1·57 per cent.) in peaches, and greatest (14·93 per cent.) in grapes; while the percentage of free acid is least in pears (0·07 per cent.), and greatest in currants (2·04 per cent.).

Fresenius observes, that as all the fruits contain albuminous or proteine matters, they are serviceable as tissue-forming food; but the albuminous matters are present in such small quantity, that these fruits will not serve without other nitrogenous food to keep the body in health. Thus, to obtain an amount of albuminous matter equivalent to the contents of one egg, we must eat more than a pound of cherries, nearly a pound and a half of grapes, two pounds of strawberries, more than two pounds and a half of apples, or four pounds of pears. They are, however, of more use as respiratory or heat-giving foods. Fresenius calculates that 1 pound of starch (which is equivalent to about 5·5 pounds of potatoes) may be replaced by 5·4 pounds of grapes, 6·7 of cherries or apples, 10·8 of currants, or 12·3 of strawberries. Fruits are, however, taken not so much for their amount of material nourishment, as for their vegetable salts (which are of great therapeutic utility), and for their agreeable flavour. In tracing the connection between the flavour and the chemical composition of fruits, Fresenius finds that the former depends (1) on the ratio in which the acid stands to the sugar, gum, pectine, &c. (the last-named substances masking the ratio in which the acid stands to the sugar); (2) on the presence and delicacy of the aroma; (3) on the proportions between the soluble matters, the insoluble matters, and the water; thus, we usually attach the highest value to those fruits which contain the largest amount of soluble, and the smallest amount of insoluble matters—a peach or a greengage almost melts in the mouth, because these fruits are relatively poor in cellulose and pectose; while, on the other hand, bilberries represent the opposite extreme, and are rich in insoluble ingredients; (4) on cultivation, which is found to cause an increase in the quantity of sugar, and a diminution of the amount of free acid and of insoluble matters; (5) and on favourable seasons, which augment the sugar and other soluble constituents.

The different berries contain, as a general rule, a larger proportion of free acid than stone-fruit or apples and pears; and their acidity is the more obvious to the taste from their containing relatively small quantities of gum and pectine. The following remarks on some of our common varieties of fruits are of practical value.

In *gooseberries*, we recognise an agreeable proportion between the sugar and the acid, the ratio being as 6 to 1 in the sweeter kinds, and 4 to 1 in less sweet varieties of this fruit. The yellow kinds are far richer in soluble ingredients than the red.

Currants are so acid to the taste, that they are almost always eaten with sugar; the ratio of the sugar to the acid being about 3 to 1.

In *strawberries*, it is the aroma that we chiefly prize. The ratio of the sugar to the acid varies with the season and the species from 2 to 1 to 6·7 to 1 (in the pine-apple strawberry).

A similar remark applies to *raspberries*. In wild raspberries, the ratio is as low as 1·8 to 1, while in cultivated kinds it is as high as 3·5 to 1.

Grapes exceed all other fruits in their amount of sugar, which is seldom less than 12, and sometimes reaches 26 per cent. In good kinds, and in favourable seasons, the ratio of the sugar to the acid is as 29 to 1; in inferior kinds, and in ordinary seasons, it is as 16 to 1; when the ratio falls to 10 to 1, the grapes are unripe and acid. In other fruits, this would be a high ratio, and they would be regarded as sweet. The anomaly may be thus explained. In unripe grapes, the skins are very thick, and contain an extremely acid juice, which overcomes the sugar contained in the interior of the berry. The juice of such grapes is found to be far sweeter than the grapes themselves.

From their large amount of sugar, and from the fact that their acidity for the most part depends on the acid tartrate of potash, which is almost entirely precipitated from the wine, grapes are incomparably superior to any other fruits in the preparation of wines; and in their fermentation, different varieties of ether of a delicate odour are formed, which, in association with volatile oils that are also present, communicate to the more valued wines their special *bouquet.*

The ratio of the acid to the sugar in the must (the expressed juice before the commencement of fermentation) affords the best evidence of the season. Thus, in the very bad wine-year of 1847, the ratio was 1 : 12; in the better wine-year of 1854, it was 1 : 16; while in the good wine-year of 1848 it was 1 : 24, the same kind of grape being experimented upon in all the cases.

Apricots and *peaches* consist almost entirely of juice, their solid constituents, after the removal of the stone, being only 1 or 2 per cent. These fruits are esteemed both for their juicy and tender flesh, and for their powerful but delicate aroma.

In *apples* and *pears*, we have an increased quantity of cellulose and pectine, and consequently a relative preponderance of the insoluble constituents. The cellulose contributes to the firmness or hardness of these fruits, while it is to the pectine that they owe their property of gelatinising when boiled. The well-marked differences of taste, &c., presented by different kinds of apples and pears, are due to the very varying relations that occur between the acid, the sugar, and the pectine, to the greater or less abundance of cellulose, and to the varying nature of the aroma. For equal quantities of sugar, pears contain less acid than apples. In the different kinds of dessert apples, the ratio of the sugar to the acid ranges between 12 to 1 and 22 to 1, while in cooking-apples it averages not more than 8 to 1.

The chemical changes which take place in the fruit during the process of ripening are described in the article PHYSIOLOGY, VEGETABLE.

Keeping of Fruit.—Many of the finest fruits undergo very speedy decomposition; and on this account, some of those most highly esteemed in the countries which produce them, have never become articles of commerce, and are only to be enjoyed—except in the state of *jam* or *preserves*—during the season of their ripening. Decomposition takes place most rapidly when fruits are exposed to the air, and particularly to stagnant air, when there is any dampness about them, and when they are subjected to considerable or frequent changes of temperature. Grapes are imported into Britain from the south of Europe, packed in saw-dust. Unripe gooseberries are kept for making tarts in winter, in bottles or jars, filled up with perfectly dry sand, saw-dust, bran, or the like, closely corked and sealed, after a gentle heat has been applied to expel moisture as much as possible, and placed in a moderate and equable temperature, which is sometimes accomplished by burying them to some depth in the earth. A similar method may be employed with many other fruits. Pears, the finest kinds of which are very apt to rot almost immediately after they reach their perfect maturity, may be kept for months in glazed earthen-ware jars very closely covered, and placed in a cool airy situation, out of the reach of frost. The layers of fruit are separated by the substance used for filling up the interstices, and the pears of the same layer are likewise kept apart, that rottenness in one may not infect the rest, which, with every kind of fruit, is very apt to take place. Another method is to keep them in drawers, the temperature being carefully regulated. Large gardens are often provided with a fruit-room, in which shelves and drawers are allotted to the different kinds of fruit. A moderate and equable temperature, dryness, and careful ventilation, are the principal requisites of the fruit-room. Fruit intended for keeping should be carefully gathered, when almost quite ripe, and all bruising avoided. Pears or apples shaken from the tree cannot be expected to keep so well as those gathered by the hand. Of all the succulent fruits produced in Britain, the apple keeps best, and is therefore most generally used. Fruit intended for keeping is sometimes *sweated* before being placed in the jars or shelves; being laid in heaps for a short time—varying according to the kind of fruit, and extending, in the case of winter-apples to a fortnight or more—that some of the juice may exude through the skin; but the propriety of this practice is doubtful. Some kinds of winter pears and apples can scarcely be said to be ripened till after they are placed in the fruit-room; and medlars are not fit for use till they have reached a state of incipient decay.

FRUIT-GARDEN. Some kinds of fruits have been cultivated from the earliest historic ages. To say nothing of the garden of Eden, and the vineyard which Noah planted after the Deluge, we find in the books of Moses evidence that the cultivation of fruits was much practised in Egypt before the time of the exode of the Israelites; and amongst the Babylonians, the Persians, the Chinese, and the inhabitants of India, it can in like manner be traced back to the most remote antiquity. The Greeks and Romans probably derived their knowledge of the art, as well as many of their finest varieties of fruit-trees, from the East; Charlemagne required attention to be paid to it throughout his wide dominions, and contributed much to its extension in regions of Europe previously too rude for its prevalence; and during the middle ages it was most successfully prosecuted by the monks in the gardens of the monasteries.

The grape, the fig, the melon, and the pomegranate, are among the first fruits of which we find any particular notice in history. The cultivation of the apple, the pear, and some others, is also unquestionably of very great antiquity. Interesting particulars concerning the most important kinds of fruit, will be found under their respective heads.

The cultivation of fruits is generally carried on in connection with that of culinary vegetables, flowers, and other objects of the gardener's care; and the fruit-garden is almost necessarily more or less combined with the kitchen-garden, &c. The term fruit-garden is generally used when the ground between fruit-trees is regularly tilled and made to produce other garden crops; the term Orchard (q. v.), when it is laid down in grass, or cultivated for grain and other agricultural crops. The latter method is practicable only with some, and these the more hardy kinds of fruit-trees.

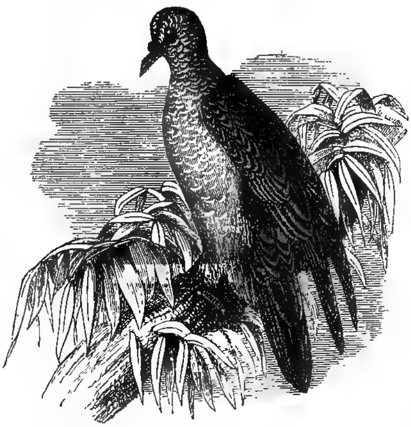
Fruit-trees, in the open air, are cultivated either as wall-trees, espalier-trees, or standards. The walls intended for fruit-trees are either of brick or stone, the former, however, being preferable, and are generally from ten to fourteen feet high. Walls serve not only for protection from winds, but for the radiation of heat, and thus counterbalance in part the disadvantages of cold climates. The training of wall-trees will be noticed in a separate article. See WALL-TREES. Espaliers (q. v.) serve in an inferior degree the purposes of walls. Walls are sometimes flued and artificially heated, by which means early ripening is secured, and varieties of fruit are produced which could not otherwise in the same locality be grown in the open air. The production of fruits belonging to warm climates is also effected in the colder parts of the world by means of Hothouses (q. v.), in which the trees are generally trained either as wall-trees or on frames stretched almost horizontally, both methods being commonly adopted in the same hothouse. Standard trees, which receive no other training than mere pruning, or the occasional tying of a principal branch, to guide it in a particular direction, are further distinguished according to the height of their stem before branching, as *full standards*, with stems six or seven feet high, more common in orchards where cattle are sometimes allowed to graze, than in gardens; *half-standards*, with stems three to five feet high; and *dwarf standards*, which, being otherwise also of small dimensions, and often bearing very fine fruit, and in great abundance, are particularly suitable for many situations, and for small gardens. The height of the stem is determined in the nursery, before grafting; but much depends upon the kind of tree; and all the varieties of some kinds may be permanently dwarfed by grafting on particular kinds of stock, as apple-trees by grafting on *paradise* stocks. Other means of still further dwarfing are practised as to trees intended for Forcing (q. v.), and to a remarkable extent by the Chinese in the cultivation of the Dwarfed Trees (q. v.), for which they are famous.

The soil of the fruit-garden requires particular attention. Different kinds of fruit-trees differ, indeed, as to the soils to which they are specially adapted, or in which they will succeed; but a rich and rather open soil is the most generally suitable. This soil must be of the depth of at least two feet, and it is better that it should be three or more; it must extend to a distance of at least eight or twelve feet from the trees, if they are not very dwarf. If the roots reach a bad subsoil, such as gravel or *till*, canker is almost sure to ensue. The care bestowed on the preparation of the soil for fruit-trees by the monks of the middle ages has seldom been equalled, and never exceeded in modern times. The whole soil of large gardens appears in some instances to have been artificially prepared; and the descent of the roots to an unfavourable subsoil was prevented by pavements. It is, of course, absolutely requisite that a fruit-garden be thoroughly drained. Manuring is sometimes unavoidable, but is apt, when injudiciously applied, to cause diseases in the trees; and when the soil requires to be enriched, road-scrapings, the scourings of ditches, rotten leaves, &c., are to be preferred. The use of guano and other artificial manures requires great caution. Where full crops of culinary vegetables are taken from the soil around the trees, there is less danger of injury from manures, although the practice, however necessary in many cases, is not the best either for the quality of the vegetables or the fruit.

The fruit-trees cultivated in Britain are almost always grafted or budded on seedling stocks either of the same or a nearly allied species. See GRAFTING. The raising and grafting of these stocks are generally carried on in the Nursery (q. v.). Some kinds of trees are propagated by layers or by suckers, and some by cuttings, the common method of propagating the varieties of gooseberries and currants. In warmer climates, these methods of propagation are more extensively used, and ungrafted seedlings are also more frequently allowed to become trees and to produce fruit. Concerning the transplanting of young fruit-trees, see TRANSPLANTING.—PRUNING will also be noticed in a separate article.—The methods of preserving the blossom from spring frosts being almost exclusively applicable to wall-trees, will be noticed under that head.

Besides fruit-trees, properly so called, some shrubs or bushes are much cultivated in Britain for the fruit which they produce, particularly the gooseberry, the red and white currant, and the black currant. Some of the fruits of tropical countries are in like manner produced by shrubs. The raspberry is only half-shrubby, the strawberry completely herbaceous; and these are the only half-shrubby or herbaceous plants much cultivated in the open air in Britain for their fruit. But in warmer climates, some of the most valuable fruits are produced by herbaceous plants, as the melon, cucumber, pumpkin, and all the kinds of gourds, the pine-apple, and, notwithstanding the tree-like size of the plants, the plantain and banana.

FRUIT-PIGEON (*Carpophaga*), a genus of *Columbidæ* (q. v.), having the bill considerably depressed at the base, compressed and moderately arched at the tip, the membrane in which the nostrils are pierced little prominent or swollen, the forehead low, and the feathers advancing on the soft part of the bill, the wings moderately long, the feet, and particularly the hinder claw, large, and formed for grasping. During the breeding-season, a curious gristly knob grows on the base of the upper mandible of some of the species, and soon after disappears. They are birds of splendid plumage, natives of the forests of India, the Indian Archipelago, the warmer parts of Australia, and the islands of the Pacific Ocean. Their food consists of fruits.



Fruit Pigeon (*Carpophaga Oceanica*).

FRUITS, in Law. The fruits of the soil, in their legal aspects, fall under various categories, and follow different destinations according to their nature, and the situation in which they are placed. If not yet separated from the soil which produced them, they are said to be *pendentes*, and as parts of the soil (*partes soli*), pass to the heir on the death of the ancestor, or are carried by a sale to the purchaser. To this, however, there is an exception in the case of industrial fruits (*fructus industriales*), such as growing corn, and all those other fruits which require yearly seed and industry. These are called in England *emblements*, and 'though still in union with the soil, follow nevertheless, in several particulars, the nature of personal, as distinguished from real estate.'—Stephen's *Com.* ii. 227. The rule is the same in Scotland, but it is strictly construed, and does not include trees or planting, natural grass, or even fruit not yet plucked from the tree. To this again, however, there is an exception in horticultural subjects, in favour of nursery-trees and plants, not of larger or longer growth than such as are usually dealt in by nurserymen. See FIXTURES. Fruits that are separated from the soil (*fructus percepti*), on the other hand, are the property of the possessor who separated them in good faith; of the tenant or former proprietor in the case of a sale; and of the personal representatives of the deceased in case of death, and not of the heir of his real or heritable estate.

The act 7 and 8 Geo. IV. c. 30, 'for consolidating and amending the laws of England relative to malicious injuries to property,' applies to trees, saplings, shrubs, and underwood; to plants, fruits, and vegetable productions in gardens, orchards, nursery-grounds, hothouses, green-houses, or conservatories; and to various kinds of cultivated roots and plants not growing in a garden, orchard, or nursery-ground. The punishments are proportioned to the injury done, whipping in certain cases being added to the statutory punishments in the case of males, by 16 and 17 Vict. c. 99, and 20 and 21 Vict. c. 3. This statute (7 and 8 Geo. IV. c. 30) is limited to England, but there is an Irish statute in some respects corresponding to it (16 and 17 Vict. c. 38). In Scotland, the trees of an orchard fall under the act for preserving planting (1698, c. 16), and several still earlier enactments; and the breaking of orchards is an offence punishable by the sheriff (Ersk. i. 4, 4). See ORCHARD, PLANTATION. Injuries done to trees or other fruits of the soil are punishable at common law, independently of all statutory provisions, as malicious mischief, both in England and in Scotland.

FRUIT-TRADE. The trade in fruit is divided into two distinct branches—the *fresh* and the *dried* fruits. Fresh fruits, such as those which grow abundantly in England, are sold for London consumption almost entirely at Covent Garden Market; the sales at Spitalfields, the Borough, Portman, and other markets being comparatively small. There are many fruit-gardens within twenty miles of the metropolis which depend almost wholly on London consumption; but since the extensive spread of railway accommodation, fruit can now be brought up from distant parts of England with great facility; and provincial towns and the metropolis can alike be well supplied. Rapid conveyance and prompt sale and delivery are essential conditions to this kind of trade, owing to the tendency of the fruit to spoil by keeping. The higher the quality of the fruit, the more certain is the sale in London. There are in the island of Jersey pear-orchards, the produce of which is contracted for at very high prices by some of the Covent Garden dealers. The orange and lemon trades are managed in rather a peculiar manner; the produce is brought to England in very swift vessels, and is mostly consigned to fruit-merchants in the neighbourhood of Lower Thames Street, who sell it to the fruiterers and the street-dealers, as well as to the markets.

Dried fruit comprises raisins, currants, figs, and the like. Grown and dried in foreign countries, chiefly bordering on the Mediterranean, these kinds of fruit mostly arrive in cases and casks; and the dealings connected with them are conducted much in the same way as those with what is called colonial produce, such as grocery.

Of raisins, currants, oranges, and lemons, the quantity imported in 1858, 1859, and 1860 was as follows:

	1858.	1859.	1860.	
Raisins, . .	160,484	337,133	206,647	Cwts.
Currants, .	182,240	225,056	306,274	Cwts.
Oranges and Lemons,	72,781	156,381	184,274	Bushels.

We present the numbers for these three years to shew how greatly the crops of these fruits vary in different seasons. Of other kinds of fruit, the official tables present the following quantities, in round numbers, imported in 1859—Almonds, 34,744 cwts.; apples, 385,046 bushels; figs, 46,040 cwts.; grapes, 19,557 bushels; chestnuts, 57,048 bushels; cocoa-nuts, 2,484,423 no.; hazel-nuts, 220,386 bushels; walnuts, 68,363 bushels; pears, 61,055 bushels; plums (French), 8702 cwts.; prunes, 16,030 cwts.; tamarinds, 634,697 lbs.

Some years ago, statistical papers in the *Morning Chronicle* gave returns concerning the quantity of fruit sold in Covent Garden and other London markets annually, estimated in the usual way by bushels, cwts., pottles, &c. About the same period, Mr Braithwaite Poole, goods-manager on the London and North-western Railway, gave tables of the amount, estimated in tons, of the fruit brought to London generally. The sources of information are not very clearly stated in either case; and as the two accounts are inconsistent one with another, they need not be given here.

FRUME'NTIUS, St, apostle of Ethiopia and the Abyssinians, born in Phœnicia towards the beginning of the 4th century. At a very early age, he and another youth, named Œdesius, accompanied their uncle Meropius, a Greek philosopher from Tyre, on a voyage undertaken for mercantile, or, according to others, for scientific purposes. On their return, they landed on the coast of Abyssinia or Ethiopia, to procure fresh water; but the savage inhabitants, under the pretext of their hostility with the Romans, made an onslaught upon them, and murdered Meropius and the whole crew, sparing only the two boys, whom they found sitting under a tree and reading. They were taken as slaves into the service of the king; and made themselves so beloved that Œdesius was soon raised to the office of cupbearer, while the more sagacious F. became the king's private secretary and accountant. After the death of the monarch, F. was appointed instructor to the young Prince Aizanes, and in this capacity he obtained a still greater influence on the administration of the state affairs. He aided the Christian merchants who sought these parts, in founding a church, and gradually paved the way for the formal introduction of the new creed. In 326, he went to Alexandria—Œdesius having returned to Tyre, where he was made presbyter—and convinced Athanasius, who had recently been nominated Bishop of Alexandria, of the necessity of appointing a special ecclesiastical dignitary for Abyssinia, who should carry out vigorously the work of conversion. Athanasius, in full synod, and with its unanimous approbation, consecrated F. himself Bishop of Axum (Auxuma). The new bishop repaired to Abyssinia, and succeeded in proselytising large numbers. He is also supposed to have translated the Bible into Ethiopian. See ETHIOPIA. On his subsequent theological disputations with Theophilus the Arian—F. himself being in all probability an Athanasian—we cannot enlarge here. F. died about 360, and his day is celebrated by the Latins on the 27th of October, by the Greeks on the 30th of November, and by the Abyssinians on the 18th of December.—Socrates, i. 15; Rufin, *Hist. Eccl.* i. 9; Theodoret, i. 22; Ludolf, *Hist. Æth.* iii. 7, 17, &c.

FRUSTUM, in Geometry, is the part of a solid next the base, left on cutting off the top by a plane parallel to the base. The frustum of a sphere or spheroid, however, is any part of these solids comprised between two circular sections; and the *middle* frustum of a sphere is that whose ends are equal circles, having the centre of the sphere in the middle of it, and equally distant from both ends.

FRY, ELIZABETH, an eminent female philanthropist and preacher of the Society of Friends, third daughter of John Gurney, Esq. of Earlham Hall, near Norwich, was born May 21, 1780. Her active and untiring exertions in the cause of suffering humanity, unparalleled in one of her own sex, acquired for her in her lifetime the name of 'the female Howard.' When not more than eighteen years of age, she established a school for eighty poor children in her father's house, with his entire sanction. In 1800, at the age of twenty, she married Joseph Fry, Esq., of Upton, Essex, then engaged in business in London, to whom she had a family of eight children. In the year 1813, the deplorable condition of the female prisoners in Newgate attracted her attention, and she resolved upon visiting them. Alone and unprotected, she entered the part of the prison where 160 of the most disorderly were immured, and addressed them with a dignity, power, and gentleness which at once fixed their attention. She then read and expounded a portion of Scripture, many of those unhappy beings having on that occasion heard the word of God for the first time. It was not, however, till about Christmas 1816 that she commenced her systematic visits to Newgate, being then particularly induced thereto by the reports of the gentlemen who, in 1815, originated the 'Society for the Improvement of Prison Discipline.' She instituted a school within the prison walls, provided work for the females, and the means of Christian instruction, and established a committee of ladies for the reformation of female prisoners. The almost immediate result was order, sobriety, and neatness, in the place of the riot, licentiousness, idleness, and filth, which had previously prevailed. In 1818, her exertions were directed to making provision for the benefit of female convicts sentenced to transportation. For the relief of females in foreign prisons, she made frequent continental journeys. She also interested herself in the abolition of slavery, the advancement of education, and the distribution of Bibles and tracts. Her labours for the improvement of British seamen, by furnishing the ships of the Coast Guard and the Royal Navy with libraries of religious and instructive books, received the sanction and assistance of government. To the poor and helpless, her charities were unbounded. As a preacher among her own sect, she was held in high estimation; and she often engaged in gospel missions, not only throughout England, Scotland, and Ireland, but to various countries on the continent. She died at Ramsgate, October 12, 1845, aged sixty-five. Soon after her death, a public meeting was held in London, the lord mayor in the chair, for establishing, as the best monument to her memory, 'The Elizabeth Fry Refuge,' for affording temporary food and shelter to destitute females, on their discharge from metropolitan prisons. Compare *Memoirs of the Life of Elizabeth Fry*, 2 vols. (Lond. 1847), published by her daughters.

FRYING. See FOOD AND DRINK.

FRYXELL, ANDERS, a Swedish historian, was born in 1795 at Hesselskog, in Dalsland; studied at Upsala; took priest's orders in 1820; and in 1828, became rector of St Mary's School, Stockholm. F. first acquired a reputation by his *Berättelser ur Svenska Historien* (Narratives from Swedish History, vols. i.—xviii., Stockh. 1832—1852). These narratives, strung together on something of the same plan as Sir Walter Scott's *Tales of a Grandfather*, are marked not only by their patriotic sentiment, but by their fresh and natural conception, their richness of biographic detail, their naive and vivacious execution, and soon obtained a wide popularity in Sweden. The first volumes of this truly national work have been repeatedly published, and have been translated into almost all European languages; for example, into English by Schoultz (2 vols., Lond. 1844), and into German by Homberg (2 vols., Stockh. 1843). The part devoted to the history of Gustavus Adolphus has also been translated into German by Homberg (2 vols., Leip. 1842—1843), into French by Mlle. N. du Puget (Paris, 1839), and into Dutch by Radijs (Utrecht, 1844); and that devoted to the history of Gustavus Vasa into German by Ekendahl (1831). F.'s *Characteristics of the Period from* 1592 *to* 1600 *in Sweden* obtained a prize offered by the Swedish Academy. Another work, entitled *Om Aristokrat-fördömandet i Svenska Historien* (4 vols. Upsala, 1845—1850), in which he endeavours to clear the Swedish aristocracy from the accusations urged against them by Geijer and others, involved him in a keen controversy with the democratic liberal party in Sweden. F. has also addicted himself to poetry and music; and an opera of his, called *Wermland's Flickan* (or 'The Lass of Wermland'), has proved very attractive to his countrymen, on account of its fine national melodies.

FUAD-MEHMED, Pasha, a Turkish statesman and litterateur, was born at Constantinople in 1814. He is the son of the celebrated poet, Izzet-Effendi-Kitchegizadé, better known under the name of Izzet-Mollah, and nephew of Leïla Khatun, one of the very few Turkish poetesses. Having received an education more literary than that of the majority of young men destined for public affairs in Turkey, he began to make himself known as an author, when the exile of his father, who had fallen into disgrace with the Sultan Mahmud, and the confiscation of the paternal property, compelled him to choose a profession. He betook himself to medicine, and studied at Galata-Sérai from 1828 to 1832. In 1834 he was appointed Admiralty physician, and accompanied the grand admiral in his expedition against Tripoli; but on his return to Constantinople, he abruptly forsook medicine, and entered the more unquiet arena of politics. For several years, he employed himself in the study of diplomacy, history, modern languages, the rights of nations, and political economy. In 1840, he became first secretary to the Turkish embassy at London, where his skill and sagacity first made themselves conspicuous. In 1843 he was named second dragoman of the Sublime Porte, and shortly after was chosen to proceed to Spain to felicitate the queen of that country on her accession to the throne. F. was very popular at the court of Madrid. It was almost impossible to believe him to be a Turk. He spoke French marvellously well, made *bon-mots* like Talleyrand, and shewed himself as gallant as an Abencerrage. Curiously enough, although a *Mohammedan*, he obtained, while in Spain, among other honours, the Grand Cord of Isabella the *Catholic*. Here also he composed a poem on the Alhambra, which Turkish critics praise highly for its novel and interesting reflections. On his return to Constantinople, he was appointed to discharge the functions of grand interpreter to the Porte, which brought him into contact with the Duke of Montpensier, who arrived at Constantinople in 1845, and who, on his return to France, invested him with the cross of Commander of the Legion of Honour. In 1850 he went on a mission to St Petersburg, and in 1853 on another to Egypt. On his return from the first of these, he became minister of foreign affairs under the grand viziership of Aali Pasha (August 1852). On the question of the 'Holy Places,' F., by his attitude, and by a brochure very hostile to the pretensions of Russia, entitled *La Vérité sur la Question des Lieux Saints*, gave great dissatisfaction to the czar. In 1854, F. went to Epirus along with Omar Pasha, acting sometimes as a diplomatist and sometimes as a general. In the following year he received the title of Pasha, and was again appointed minister of foreign affairs, an office which he has since held, except for a short interval in 1857. To him especially, it is said, Turkey owes the hatti-sherif of 1856, ordering the consolidation of the external defences of the Porte and the institution of telegraphs and light-houses.

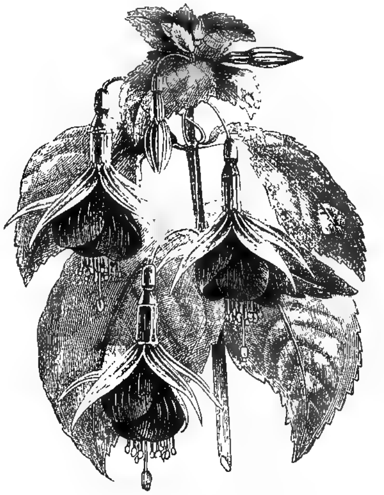
When the Turkish Academy of Science and Belles-Lettres was established in 1851, F. was one of the first members, and in the following year he published a *Turkish Grammar*, which is highly esteemed by native scholars. He has been loaded with distinctions by European sovereigns.

FUCA, Strait of, a passage separating Washington Territory in the United States from Vancouver's Island, and connecting the Pacific Ocean with the Gulf of Georgia, has its outer or western entrance in lat. 48° 10′ N., and long. 124° W. It contains several islands, one of which, San Juan, became, in 1859, the subject of a dispute between Great Britain and the United States; the question being, whether it was to be regarded as an appendage of Washington Territory or British Columbia. This strait has also been prominent in the history of discovery; its first explorer, from whom it takes its name, having professed to believe, that, in traversing the entire length of the Gulf of Georgia, he had crossed from the Pacific to the Atlantic.

FUCA′CEÆ, according to Lindley, a natural order of Acotyledonous plants; but more generally regarded by botanists as a sub-order of *Algæ*. The species are numerous, about 500 being known, mostly growing in salt water. They are distinguished from the other algæ by their organs of reproduction, which consist of spores and antheridia, contained in common chambers or conceptacles, which are united in club-shaped receptacles at the end or margins of the fronds. The antheridia contain phytozoa. The frond is sometimes a stalk expanding into a broad blade, and sometimes exhibits no such expansion, and is either simple or variously branched. Many of the F. are provided with vesicles containing air, by the aid of which they are enabled to float in the water. Some attain a great size—*Macrocystis pyrifera* is said to have fronds of 500 to 1500 feet in length; its stem not being thicker than the finger, and the upper branches as slender as pack-thread. Most of the F. contain iodine in very considerable quantity, and some of them are therefore much used for the manufacture of Kelp (q. v.), particularly different species of *Fucus*, or Wrack, and *Laminaria*, or Tangle. On account of the soda which they contain, they are also valuable as a manure. Some of them are eatable, containing large quantities of gelatinous matter, as the Dulse (q. v.), Tangle (q. v.), and Badderlocks (q. v.) of the British coasts, and certain species of *Sargassum* in other parts of the world. The medicinal uses of some of them seem to depend upon the iodine which they contain, and which it is now considered preferable to exhibit in other forms, after it has been extracted.

FU-CHOW-FOO (Happy City), a city and port of China, and capital of the province of Fuhkeen. It is beautifully situated on the left bank of the Min, 25 miles distant from the mouth of that river, in lat. 26° 3′ N., long. about 119° 50′ E., and was opened to foreign commerce by the treaty of 1842. The walls of the city are about 30 feet in height, and 8 miles in circumference, and have seven gates, the gateways of which are constructed of bricks, resting on a foundation of granite. The most important public buildings are the vice-regal palace and government yamuns, the temples of Confucius, of the god of war, and of the goddess of mercy. The beautiful bridge of 200 arches over the river Min is 12 feet wide, and about 12,000 feet long. Both sides are crowded with stalls, which narrow the bridge-path to 8 feet. A Buddhist monastery has been converted into the British consulate, which overlooks the town from a height of several hundred feet. The sturdy peasant-women of F., who are neat in their dress, and healthy in appearance, do most of the carrying work, and leave their feet as nature made them. The lacquered ware of F. is said to be of special excellence. It sends us tea to the extent of fifty millions of pounds annually; but timber comprises 9-11ths of the export trade. The population of the city has been estimated at 500,000.

FU′CHSIA, a genus of plants of the natural order *Onagraceæ*, containing a large number of species, natives of South America and of the southern parts of North America. They are half-shrubby plants, shrubs, sometimes climbers, and small trees, and have generally pendulous red flowers; of which the calyx is funnel-shaped, 4-cleft, finely coloured; the corolla 4-petaled: the fruit is a 4-celled berry; the leaves are opposite; the flower-stalks 1-flowered, springing from the axils of the leaves, or sometimes forming racemes at the top of the branches. Some of the species, as *F. coccinea*, *F. gracilis*, *F. globosa*, *F. fulgens*, *F. macrostemon*, *F. longiflora*, are much cultivated in gardens and greenhouses for the beauty of their flowers. Most of the species are too delicate for the climate, at least of the northern parts of Britain; but some of them, although killed to the ground every winter by frost, spring again from the root, and flower beautifully in autumn. A little protection around the root is of great use in preserving them in vigour. All of them are propagated with extreme facility by cuttings, which has no doubt contributed to their present abundance, even in the gardens and windows of the poor. No flowering shrubs of recent introduction into Britain have become nearly so popular as those of this genus; and new varieties and hybrids have been produced in vast numbers, of which those with white flowers are particularly prized. The berries of a number of the species are eaten in South America, and preserved with sugar; and they are occasionally used in both these ways in Britain, although in Scotland the fruit even of the most hardy ripens only in favourable situations, for the most part on the west coast. Where the climate admits of it, a F. hedge is extremely ornamental.



Seedling Fuchsia (*Colossus*):
Grown, in 1843, at Bagshot.

The wood of some species is employed in their native regions for dyeing black. The genus is named in honour of Leonhard Fuchs, one of the fathers of modern botany, born in Swabia in 1501, died at Tübingen, where he was a professor, in 1565.

FUCHS'S SOLUBLE GLASS is a peculiar silicate, which is prepared by melting together 8 parts of carbonate of soda, or 10 parts of carbonate of potash, with 15 of pure quartz sand, and 1 part of charcoal, which is added to facilitate the decomposition of the alkaline carbonate. A black glass is thus obtained, which is not soluble in cold water, but dissolves in about six times its weight of boiling water. Fuchs commenced his experiments on this subject in 1825, and has continued and varied them ever since. The above is, however, we believe, the most approved formula. The practical uses of the soluble glass to which he especially directed his attention were two—viz. (1), as a varnish, which, applied in the fluid form to stone surfaces, would harden into a glass, and prevent the ordinary effects of atmospheric influences; and (2) as a means of fixing fresco-colours by the process known as stereochromy. At the request of the late Prince Consort, Dr Fuchs gave a summary of all that he had done in this department in a paper which he read before the Society of Arts in 1859. See FRESCO.

It may be mentioned that Professor Kuhlmann of Lille has been long working at the same subject; and in 1857, published his method of producing a stone-protecting silicate; and that our own countryman, Mr Ransome of Ipswich, has not only employed concentrated solutions of silicate of potash, or of soda, as a cement for consolidating silicious sand into a very hard, durable, artificial sandstone, capable, before it is fired, of being moulded into any desired form, but has likewise produced a vitreous varnish, consisting of silicate of potash, after which he applies a coating of a solution of chloride of calcium: a silicate of lime is thus formed, which is stated to be very successful in protecting the surface of stone from external influence. Wood that has been painted with these varieties of soluble glass is rendered nearly if not quite fire-proof.

FUCI'NO, LAKE OF, or LAGO DI COLANO (ancient *Fucinus Lacus*), a lake of Naples, in the province of Abruzzo Ultra II., remarkable as the only one of any extent found in the Central Apennines. It is 10 miles long by 7 broad, and is situated at an elevation of 2176 feet above the sea-level. It is subject to sudden risings; and in ancient times, by order of the Emperor Claudius, a magnificent subterranean channel more than three miles in length, to carry off the surplus waters, was cut partly through the solid rock of Monte Salviano, rising 1000 feet above. This tunnel became obstructed in the middle ages, and long remained so, notwithstanding many attempts to clear it. The consequence was, that in recent times the surrounding country has been often submerged. In 1855, operations were commenced for the restoration of the Claudian Aqueduct, and on August 9, 1862, the work was completed, through the assistance of the prince of Tarlonia. The entire drainage of the lake is still going on.

FUCUS. See FUCACEÆ and WRACK.

FUEL. This term is generally applied to combustibles used for the production of heat; also, less frequently, to combustibles such as oil, Paraffine Oil (q. v.), used for lighting. Under articles COAL, COKE, &c., will be found details of the physical properties and chemical composition of the various fuels; the following observations bear chiefly on their economical application as sources of motive power.

The two elementary bodies to which we owe the heating powers of all our fuels, natural and artificial, are carbon and hydrogen. Coke, wood charcoal, peat charcoal, and anthracite, contain little or none of the latter element, and may be regarded as purely carbonaceous fuels. But wood, peat, and most varieties of coal, contain hydrogen as well as carbon; and in their combustion, these two substances combine to produce volatile and combustible hydrocarbons, which are volatilised previous to being consumed, while a purely carbonaceous fuel evolves no volatile matter until combustion has been effected.

These hydrocarbons are numerous and varied in composition (see CARBOHYDROGENS); but when combustion is perfect, the amount of heat produced by any hydrocarbon is exactly what would have been produced had the hydrogen and carbon been burned separately. It will be of advantage, therefore, to study these two elementary combustibles in succession, in order to estimate subsequently the combined effect where they come together in the same fuel.

The heating power of a combustible, or the *amount* of heat generated by it, is usually expressed in degrees Fahrenheit on so many pounds' weight of water. But in estimating the *temperature*, or intensity of heat produced, we have to keep in view that different substances have different capacities for heat—that of water being generally assumed as unity. The number expressing this capacity is called the specific heat of the substance. Water 1000, carbonic acid 221, imply that while 1000 units of heat are required to elevate the temperature of water any given number of degrees, only 221 units are required to elevate to the same temperature an equal weight of carbonic acid.

CARBON AS FUEL.—1. *Amount of air required for combustion.*—Burned in air, carbon combines with the oxygen to form carbonic acid (CO_2), mingled with nitrogen, the other atmospheric element. The chemical change may be thus represented, atomically:

			Products of Combustion.	
Carbon,		6·0		
Air (69·6)	Oxygen,	16·0	Carbonic acid,	22·0
	Nitrogen,	53·6	Nitrogen, .	53·6
		75·6		75·6

Or, assuming carbon as unity:

Carbon,		1·000		
Air (11·6)	Oxygen,	2·667	Carbonic acid,	3·667
	Nitrogen,	8·933	Nitrogen, .	8·933
		12·600		12·600

Carbon, therefore, requires about twelve times its own weight of air for perfect combustion.

2. *Amount of Heat produced.*—Andrews found that 1 lb. carbon produced heat equal to 1° F. in 14,220 lbs. of water. Other observations agree very closely. This may be otherwise stated thus: 1 lb. carbon will raise from freezing to boiling point (32° to 212° = 180°) $\frac{14220}{180} = 79$ lbs. water; from mean temperature to boiling-point (60° to 212° = 152°) $\frac{14220}{152} = 93\cdot5$ lbs. water; will boil off in steam from mean temperature (60° to 212° = 152°, add latent heat in steam, 965° = 1117°), $\frac{14220}{1117} = 12\cdot73$ lbs. water; and will boil off in steam from boiling-point (latent heat in steam, 965°) $\frac{14220}{965} = 14\cdot74$ lbs.

3. *Utmost Temperature or Intensity of Heat from Carbon.*—Here we suppose the combustion effected in a space enclosed by non-conducting material, so that all the heat produced by 1 lb. carbon is

retained by the products of its combustion. Caloric sufficient to raise 14,220 lbs. water 1° F. is thus compressed, as it were, into 12·6 lbs. of carbonic acid and nitrogen. To determine the temperature thus produced, we require to know the specific heat of this gaseous compound, that of water being 1.

3·667 lbs.	carbonic acid.	Specific heat,	·2210
8·933 ″	nitrogen.	″ ″	·2754
12·600 ″	products of combustion.	Mean sp. ″	·2596

14,220° on water at 1·000 specific heat, will give 54,776° on these products per pound-weight. Distributed over 12·6 lbs., this heat will raise the temperature to $\frac{54776}{12·6} = 4347°$ F., which is therefore the utmost intensity of heat attainable in burning carbon, supposing no loss by absorption or radiation.

4. *Effect of Excess of Air.*—Excess of air has been proved to have no effect on the *quantity* of heat produced where combustion is perfect; but the intensity of *temperature* is diminished. Suppose two equivalents of air admitted; we then have as the products of combustion—

3·667 lbs.	carbonic acid.	Specific heat,	·2210
8·933 ″	nitrogen.	″ ″	·2754
11·600 ″	air in excess.	″ ″	·2669
24·200 ″	products.	Mean sp. ″	·2631

14,220° on water = 54,048° on this new mixture of gases. But the heat is now diffused over 24·2 lbs. matter instead of 12·6 lbs., $\frac{54048}{24·2} = 2347°$ F. . the utmost temperature produced by carbon burned in two equivalents of air.

The utmost temperatures attainable, with various proportions of air, are given below, and also the appearance which the interior of the furnace would exhibit. Flame at these temperatures will present the same differences in colour.

Weight.		Ratio of Fuel to Air.	Highest Possible Temperature.	Appearance of a Body exposed to such Temperature.
Carbon.	Air.			
lbs.	lbs.			
1·	11·6	1 to 1	4347°	Intensely brilliant.
1·	17·4	1 ″ 1½	2951	Dazzling white.
1·	23·2	1 ″ 2	2233	Bright ignition.
1·	29·0	1 ″ 2½	1797	Full cherry red.
1·	34·8	1 ″ 3	1503	Commencing cherry red.
1·	58·	1 ″ 5	908	Incipient red.
1·	69·6	1 ″ 6	758	Black.

5. *Effect of Deficiency of Air.*—If, before reaching the upper layers of carbon or cinder, the air has parted with all its oxygen to form carbonic acid with the production of heat, then the carbonic acid combines with part of the remaining carbon to form Carbonic Oxide, CO (q. v.), but without producing heat. The loss may amount, therefore, to one-half of the fuel: some have stated it as high as three-fourths. If this oxide, when it gets above the fuel, meet with air before cooling, it burns with a pale blue flame, restoring part of the lost heat; but to what extent has not yet been determined.

6. *Effect of Water Present.*—Passing into vapour, water absorbs both sensible and latent heat, and thus diminishes the temperature. Heating power is also lost, as products of combustion are generally passed into the atmosphere at a high temperature.

HYDROGEN AS FUEL.—1. *Air required.*—Hydrogen combines with the oxygen of the air to form vapour of water, mingled with nitrogen:

				Products of Combustion.	
Hydrogen,		1·			
Air (34·8)	Oxygen,	8·	→	Vapour of water,	9·
	Nitrogen,	26·8		Nitrogen, .	26·8
		35·8			35·8

1 lb. hydrogen therefore
while 1 lb. carbon requires

2. *Amount of Heat Pr*
heat produced from hyd
than that from carbon;
heating 60,840 lbs. water
however, latent in the wa
deducted in calculating in
heating effect under all
This deduction amounts
latent = 8685°, leaving 5
heating power of 1 lb. hydr

3. *Utmost Temperature or*
is *less* than in the case of
specific heat and greater quan
We have—

Vapour of water,	9· lbs.	Spec		
Nitrogen, . .	26·8 ″	″		
	35·8 ″	Mean sp. ″		

52,155° on water will be 124,445° on these products; and $\frac{124445}{35·8}$ lbs. = 3476°, is the utmost possible temperature.

4. *Effect of Excess of Air.*—As in the case of carbon, the intensity of heat is diminished, as under:

Weight.		Ratio of Fuel to Air.	Highest Possible Temperature.
Hydrogen.	Air.		
lbs.	lbs.		
1·	34·8	1 to 1	3476°
1·	69·6	1 ″ 2	2187
1·	104·4	1 ″ 3	1591
1·	139·2	1 ″ 4	1250

5. *Effect of Deficiency of Air.*—No new product is the result of deficiency of air, as in combustion of carbon; the hydrogen simply escapes unconsumed.

6. *Effect of water-vapour present* is diminution of intensity and ultimate loss of heat in application, as in the case of carbon.

Temperature of Ignition of Carbon and Hydrogen.—These substances must be themselves heated before they can burn. Hydrogen begins to burn at or below 300°, while carbon requires a red heat (800° to 1000° F.), and even at that temperature burns very slowly. Consequently, where they are combined, as in common coal, the temperature present is often sufficiently high to ignite and consume the hydrogen, while the carbon remains unchanged as cinder, or passes away as smoke, unconsumed in either case.

All that has been said above, of carbon, as to air required, heating power or value, utmost temperature, temperature of ignition, effect of water present, and of excess or deficiency of air, applies, without modification, to one class of fuels—the purely carbonaceous, including anthracite, coke from coal, charcoal from wood and peat, and the cinder of any description of fuel. The incombustible ash must be allowed for in calculating heating power or value; and also the volatile bodies—nitrogen, sulphur, &c.—the latter of which frequently renders the fuel unsuitable for many purposes in the arts and manufactures.

Peat, wood, and coal, with the exception of anthracite, contain hydrogen to an extent rarely exceeding 5 per cent. We have seen that, compared with carbon, hydrogen requires three times as much air, and generates nearly four times as much heat, but produces 20 per cent. less intensity of heat, and ignites at a much lower temperature; and the combustion of wood, coal, &c., is in these respects modified according to the proportion of hydrogen present in them.

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ews the composition of d by Playfair and De la Beche. Columns 8 to 12 are added to illustrate the process of combustion.

	Average Composition.				On Distillation, there is						
					Left as Coke or Cinder.		Expelled in Gaseous Form.				Proportion of Hydrogen to Carbon.
								As Volatile Hydrocarbons.			
	gen.	Water = Hydrogen and Oxygen.	Sulphur and Nitrogen.	Incombustible Ash.	Ash.	Carbon.	Water, Sulphur, and Nitrogen.	Hydrogen.	Carbon.	Total.	
	7	4·67	2·41	4·91	4·91	67·69	6·68	4·27	16·09	20·36	1 to 3·8
	60	6·40	2·59	3·77	3·77	56·90	8·99	4·60	25·22	29·82	1 " 5·5
	53	10·72	2·74	4·88	4·88	55·34	13·46	4·53	22·56	26·69	1 " 5·4
	4·40	10·90	2·11	4·03	4·03	50·19	13·01	4·40	28·34	32·74	1 " 6·4
	3·66	11·56	2·42	2·65	2·65	56·67	13·98	3·66	23·01	26·67	1 " 6·3
1	2	3	4	5	6	7	8	9	10	11	12

When coal is heated in a retort, it yields volatile Hydrocarbons (q. v.), amounting to 20 to 32 per cent. of its weight (see column 11). The hydrogen has robbed the fuel of six times its own weight of carbon. When fresh fuel is added to live coal in a furnace, the same result ensues; so that in using coal, 50 to 67 per cent. of carbon burn on the grate, and 20 to 32 per cent. carbon and hydrogen have to be burned in the open space above the fuel, or escape unconsumed.

The elements of a hydrocarbon are consumed, not simultaneously, but in succession. First, the carbon is separated from the hydrogen in light floating particles, subsequently seen as soot or smoke (if not consumed); then the hydrogen burns, and communicates heat to the carbon particles, which then appear as flame. The colour of the flame indicates the temperature present; and if the temperature is sufficiently high, the carbon of which the flame is composed burns also, producing a further increase of heat. If not, the flame, as it moves onward, cools, becoming red, dull red, and finally black and smoky, passing away as such. For complete combustion of common coal, we therefore require not only air in sufficient quantity, but also intensity of heat above the fuel. We require a low temperature to separate the carbon from the hydrogen; a higher temperature to consume the hydrogen; and a still higher to consume the carbon of the flame. In closed furnaces, such as those of steam-boilers, while the current of air supplied continues pretty uniform in quantity, the volatile bodies are evolved almost immediately after fuelling; and would require, for the moment, perhaps four times the quantity of air which is passing through. The volatile fuel is, in consequence of the want of air, carried off partly unconsumed; and the temperature in such furnaces is frequently too low for the ignition of carbon, as may be seen from the colour of the flame; the cold boiler having abstracted the heat before the flame has been subjected to its influence. We refer to the article SMOKE, CONSUMPTION OF, for an account of the plans which have been adopted to secure perfect combustion, and thus prevent smoke. From the principles involved, we should expect most success where the fuel is supplied by mechanical arrangements as regularly and uniformly as the air, and where, in addition, the body of the furnace is protected or removed so far from boiler-surface and other cooling agents as is necessary to maintain a temperature within it sufficient for the thorough ignition of the flame. In house-fires, where the heat is lost if not radiated forward into the room, the cinders should be drawn to the front, and the fresh fuel laid into the vacant space behind. The gases rise between the two, and being highly heated, form a sheet of flame above and behind the red-hot fuel in front. If, as is commonly done, we throw the fresh fuel on the top of the live coal, we interrupt the process of radiation, and the gaseous part of the fuel is thrown off rapidly into the cool atmosphere above the grate, and does not take fire until a considerable period has elapsed. To our ordinary fire utensils, we might with advantage add one of a rake shape, suited for drawing forward the fuel.

For dimensions of furnaces, &c., see STEAM-ENGINE.

Economy of fuel will be best secured, first, by accomplishing perfect combustion both of the fixed and volatile parts of the fuel; and secondly, by regulating the amount of air, as any excess of this has to be passed on to the chimney at the same high temperature as the true products of combustion.

The abundance or scarcity of fuel has a great effect on the general interests of a country and the comfort of its inhabitants. The wealth and prosperity of Britain must be attributed in no small degree to the abundance of coal in those districts both of England and Scotland in which ironstone is most abundant, and in which, therefore, the coal is required as fuel for smelting it. But even for the most ordinary uses of domestic economy, the scarcity of fuel in some parts of the world causes much hardship to their inhabitants, whilst its abundance in others is one of their greatest natural advantages. Coal, wood, and peat are the three kinds of fuel principally used; coal being indeed the vegetation of former ages—or rather of former geological periods—the product of their sunshine and their showers, treasured up for the present; peat, a recent formation. Coal may be said in general to be of about twice the value of wood as fuel, weight for weight, in its heating power. In those parts of the world in which coal is not found, or to which it cannot be easily—or as yet profitably—conveyed, the preservation of forests is of great importance; and trees are not unfrequently planted, as in some parts of Europe, in hedgerows and otherwise, chiefly in order to provide a supply of fuel. For the same reason, pollarding is resorted to, the branches being used as fuel, and the trunk left to produce new branches. Only some kinds of trees are adapted to this mode of treatment. In some regions, as on some of the steppes of Asia and other treeless plains, the dried dung of herbivorous animals is much used as fuel. In cases of less extreme necessity, all kinds of vegetable refuse are used. Thus, in many parts of the continent of Europe, things are carefully gathered up for fuel which in any part of Britain would most probably be burned on the field, to get them out of the way. But it is not easy to compute the benefit derived by many parts even of Britain, particularly the inland parts, from the recent great increase of the facilities of communication and of the trade in coal.

FUENTE DE OVEJUNA (The Sheep-well), a small walled town of Spain, in the province of Cordova, and 44 miles north-west of the town of that name, is situated on the crest and sides of a conical hill, between two of the upper branches of the Guadiata. At the foot of the hill, and on its western side, are the wells from which this town has derived its name. It has manufactures of linens, woollens, and leather. Coal-seams occur in the vicinity. Pop. about 5500.

FUE'NTES DE ONORO (The Fountains of Honour), a small village of Salamanca, Spain, on the Portuguese frontier, 14 miles west of Ciudad Rodrigo, is well known as the scene of one of the important battles of the Peninsular War, between the English under Wellington, and the French under Massena. Wellington, who had resolved to abide battle, drew up his forces between the Coa and the Agueda, his line extending north and south for about seven miles, and his right wing stretching two miles south of F. de Onoro. On the 3d May 1811, this village was fiercely attacked by a strong body of French troops, who forced the English from the streets, and were not dislodged until the English, reinforced by three regiments, drove them by a terrific charge from their position, with a loss in all of 300 men. On the 5th, the battle proper commenced. The French, much stronger than their enemies both in cavalry and infantry, assailed Wellington's right with overwhelming numbers, and although prodigies of valour were performed by the English—as in the case of Ramsey's brigade of horse-artillery, which cut its way through a solid body of cavalry—their right wing was turned, and their position lost. Never during the war were the English forces more perilously situated. Meanwhile, at F. de O., on which Wellington's *left* wing now rested, a fierce battle was being fought. The three English regiments who had been left in occupation made a desperate resistance against assailing multitudes. The fight lasted here till evening, reinforcements having been brought up on both sides; and the night closed upon the English holding the crags above the town, and the retiring regiments of the French. The loss of the allies amounted to 1500, while that of the French was stated at the time to be nearly 5000, and was certainly greater than that of the allies. Neither army could claim a decided advantage in this battle; but its result was, that on the 10th, the French were forced across the Portuguese frontier; and thus ended the French invasion of Portugal.

FU'ERO, a Spanish word derived from Lat. *forum*, signifies strictly, the seat of justice, jurisdiction. In this last sense, it was transferred to collections of laws, and specially to the civic rights granted by the kings to individual cities, the most famous of which were the fuero of Leon and that of Naxera. As these city charters contained for the most part special liberties, concessions, and privileges, the word fuero became current chiefly in this sense, and was particularly so applied to designate the body of privileges and liberties that made up the constitution of Navarre, and of the three Basque provinces of Biscaya, Alava, and Guipuzcoa. These are the fueros the maintenance of which gave rise to wars in the Basque provinces in 1833. The fueros of other provinces and cities of Spain have been long extinct.

These Basque fueros are grounded on the old laws of the Visigoths, and grew up in the period between the irruption of the Moors into the Spanish peninsula and the consolidation of the Spanish monarchy under the House of Hapsburg. The same was the case in the half-Basque province of Navarre, which formed an independent kingdom under its own sovereigns. The fueros are thus the product of the ancient Gothic laws—those fertile sources of modern rights—and the new circumstances in which they were placed. They resulted by degrees, here as elsewhere, in a struggle between the people and the princes; and their development forms an interesting chapter in the history of modern constitutionalism. They were at first only privileges and statutory rights granted to single places, and from these were extended to others. By the introduction of the representative element of the Cortes, and extension over whole provinces, they were then transformed, in virtue of the general law of custom, into constitutional rights of these provinces; and were in time collected and formally embodied and sanctioned as such. It was in this way that the fueros of Navarre, which had been growing into consistency for centuries previously, were, in 1236, during the contests between King Theobald and his Cortes, collected and recorded, and remain yet under the title of *Cartulario del Rey Tibaldo*. Ferdinand the Catholic, who united Navarre with the crown of Castile, maintained the fueros, adapting them to the new relation to Castile. Their leading provisions are these: The Cortes, chosen for three years, and consisting of the three estates of clergy, nobles, and commons, are to meet yearly; and without their consent, no law can be passed, or anything of importance undertaken. The government consists of the viceroy, who presides in the Cortes and Great Council; the Great Council of Navarre (a body similar to the old French parliaments); and the Contaduria, before which all accounts of revenue and expenditure must be laid. There is no custom-house or toll but at the frontier, and except the trifling grant of 176,000 reals, nothing flows into the royal treasury. All these fueros the king must bind himself by a royal oath to maintain.

In the lordship (Señorio) of Biscaya, the fueros grew up in the contests of the inhabitants with their counts. They were first collected into a code by Count Juan in 1371, which, after the final union of Biscaya with Castile, was recast (1526), completed, and confirmed by King Charles I. (the German emperor Charles V.). According to this charter of rights, every new 'Lord'—for only so do the Biscayans style the king of Spain as their prince—fourteen years old, must come into the country within a year, and take the oath to uphold the fueros in certain places appointed for that purpose. The government consists of a corregidor, appointed by the 'Lord,' and two deputies; these, aided by six regidores, and forming the regimiento, conduct the administration. But the supreme power resides in the General Assembly (Junta General), which meets yearly under the tree at Guernica, and regulates all the affairs of the lordship, and appoints the deputies and regidores. Justice is administered, in the first instance, by the lieutenants (Tenentes) of the corregidor; in the second, by the corregidor and deputies; and in the third, by the royal court at Valladolid. Other privileges are, that every Biscayan of pure blood is counted noble; that except the post-office there is to be no royal governing board in the province; that Biscayans are not bound to serve in the Spanish army, nor to receive Spanish troops. The fueros of Alava and Guipuzcoa are of analogous origin and character, but differing in details. These fueros were almost entirely abolished by Espartero, but were restored by Queen Isabella in 1844. See Spain.

FUE'RTEVENTU'RA. See Canaries.

FUGÆ. See MEDITATIO FUGÆ.

FUGA'RO, the name of a well-known stop of the flute kind in continental organs of 4-feet pitch, and sometimes of 8-feet pitch, of a small scale, made of wood or tin; in tone it is as piercing as the *gamba*, but much clearer.

FUGGER, one of the most remarkable families in Germany, which, rising by industry and commerce, has founded numerous lines of counts, and even princes. The ancestor of the family was John F., master-weaver in Graben, near Augsburg. His eldest son, John F., acquired by marriage, in 1370, the freedom of Augsburg, and began to carry on a trade in linen along with weaving. By a second marriage, in 1382, with the daughter of a councillor, he had two sons and four daughters. This John F. was one of the council of twelve (Ger. *Die Zwölfer*, 'the twelvers') in the weaver-guild, and an assessor of the famous Fehmgericht (q. v.) or secret tribunal of Westphalia. He died in 1409, and left what was a large fortune for the time—3000 guldens or florins.

His eldest son, Andrew F., made such good use of his share of the inheritance that he got the name of 'the Rich Fugger.' By marriage, he founded a noble line, which, however, died out in 1585. John's second son, Jacob F., who died in 1469, was superior and 'twelver' of the weaver-guild, and a man held in high esteem by his fellow-citizens; he was the first of the Fuggers that had a house in Augsburg, and he already carried on an extensive commerce.

Of his seven sons, three, Ulrich, George, and Jacob II., by means of industry, ability, and integrity, extended their business to an extraordinary degree, and laid the foundation for the palmy days of the family. They married into the noblest houses, and were raised by the Emperor Maximilian to the rank of nobles. The emperor mortgaged to them, for 70,000 gold guldens, the county of Kirchberg and the lordship of Weissenhorn, and received from them afterwards, through the mediation of Pope Julius II., 170,000 ducats, to assist in carrying on the war against Venice. Ulrich F., born 1441, died 1510, devoted himself specially to the commerce that he opened up with Austria, and there was almost no object that did not enter into his speculations; even the master-pieces of Albert Dürer went through his hands to Italy. Jacob F., born 1459, died 1525, engaged in mining; he farmed the mines in Tyrol, and accumulated immense wealth; he lent to the Archduke of Austria 150,000 guldens, and built the magnificent castle of Fuggerau, in Tyrol. Thus the wealth of the Fuggers went on increasing. Their wares went to all lands, and scarce a road or sea but bore their wagons or ships.

But it was under Charles V. that the House attained its greatest splendour. Jacob having died childless, and the family of Ulrich being also extinct, the fortunes and splendour of the house rested on the sons of George F., who died in 1506. At his death, he left three sons, one of whom, Marcus, entered the church; the two younger, Raimund and Antony, carried on the business, and became the founders of the two chief and still flourishing lines of the House of Fugger. The two brothers were zealous Catholics, and with their wealth supported Eck in his opposition to Luther. During the diet held by Charles V. at Augsburg, in 1530, the emperor lived in Antony F.'s splendid house in the Wine Market. On this occasion, he raised both brothers to the rank of counts, and invested them with the still mortgaged properties of Kirchberg and Weissenhorn; and a letter under the imperial seal conferred on them the rights of princes. For the support they afforded him in his expedition against Algiers in 1535, they received the right of coining money. Antony F., at his death, left six millions gold crowns in ready money, besides jewels and possessions in all parts of Europe and in both Indies. It is of him that the Emperor Charles is said to have remarked while being shewn the royal treasury in Paris: 'There is a linen-weaver in Augsburg that could pay all that out of his own purse.'

The Emperor Ferdinand II. raised the splendour of the House of F. still higher while confirming the imperial letter of Charles, by conferring great additional privileges on the two oldest of the family, Counts John and Jerome. The Fuggers continued still as nobles to carry on their commerce, and further increased their immense wealth. They attained the highest posts in the empire, and several princely houses prided themselves on their alliance with the House of Fugger. They possessed the most extensive libraries and collections of objects of art, maintained painters and musicians, and liberally encouraged art and science. Their houses and gardens were master-pieces of the architecture and taste of the times. There is thus nothing incredible in the story that Antony F., on one occasion when Charles V. was his visitor, lighted a fire of cinnamon wood with the emperor's bond for money lent him.

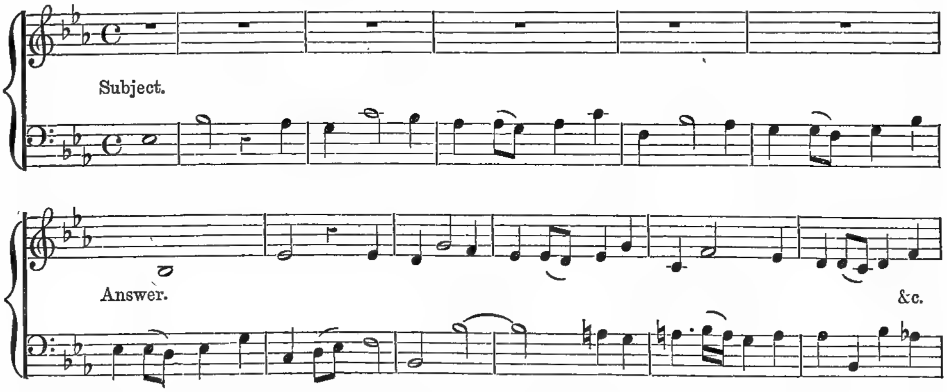
While thus indulging in splendour, they were not less bent on doing good. Ulrich, George, and Jacob, the sons of the beneficent Jacob, bought houses in one of the suburbs of Augsburg, pulled them down, and built 108 smaller houses, which they let to poor citizens at a low rent. This was the origin of the 'Fuggerei,' which still remains under the same name, with its own walls and gates. Many other benevolent institutions were set on foot by Antony F. and his sons. It is questionable if we are to rank among their benefactions their calling the Jesuits to Augsburg, and giving them buildings and revenues for a college, church, and school. The race is still continued in the two principal lines of Raimund and Antony, besides collateral branches. The domains are chiefly in Bavaria. A collection of portraits of the most important members of this great house, executed by Domin. Custos of Antwerp, appeared at Augsburg (1593 et seq.). This collection (increased to 127, with genealogies written in Latin) was republished by the brothers Kilian (Augsburg 1618); and in 1754, a new edition of the work, still further improved, and containing 139 portraits, was published at Ulm, under the title *Pinacotheca Fuggerorum.*

FUGITA'TION. A sentence of fugitation in Scotland corresponds to outlawry in a criminal process in England, and is pronounced where a person fails to appear to answer to a criminal prosecution against him. Amongst other consequences, it entails the escheat of his whole movable property to the crown. See ESCHEAT.

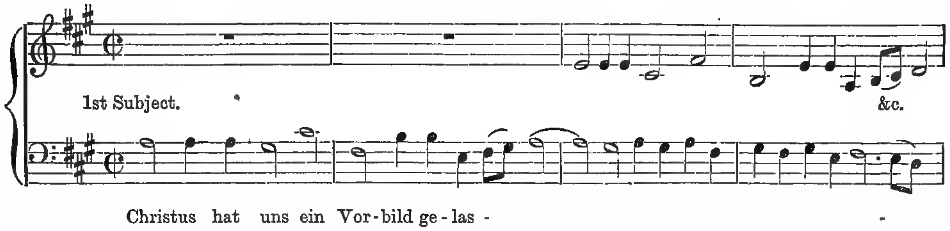
FUGITIVE SLAVE LAW. Slaves being regarded as property, things and not persons, as the Roman law puts it, the existence in every state in which slavery exists of a law recognising the right of the master to reclaim his property follows as a logical consequence. Accordingly, the constitution of the United States of America having recognised slavery, or 'service,' as it is gently termed by American writers, necessarily contained a number of enactments for its enforcement. By art. 4, s. 2 of that document, it is declared that persons held to service or labour in one state, under the laws thereof, and escaping into another, shall be delivered up, on claim of the party to whom such service or labour may be due. In furtherance of this provision, the laws of New York have provided for the arrest of such fugitives, on *habeas corpus*, founded on due proof, and for a certificate in favour of the right of the claimant, and delivery of the fugitive to him, to be removed. The existing law, as narrated in the latest edition of Kent, seems to be the following: The act of 1793, providing for the reclamation of fugitives from justice and from service, has, so far as relates to the latter, been amended, and to a considerable extent superseded by the act of September 18, 1850. The judicial duties imposed by the latter act are to be performed by the United States commissioners, who may have the power of arresting or imprisoning for offences against the United States, by the judges of the circuit and district courts of the United States, and of the superior courts of territories, and by such special commissioners as the respective courts may appoint. It is the duty of all United States marshals to obey and execute all warrants and process of such judges and commissioners; and after the arrest of any fugitives, such officers are liable for an escape with or without their assent. When any fugitive has escaped into another state or territory, the owner, or his duly authorised agent, may pursue and personally arrest said fugitive, or may demand a warrant and arrest from the officer having due authority. The fugitive is then to be taken before a commissioner or judge, whose duty it is to hear and determine the complaint in a summary manner. Should he be satisfied of the validity of the claim and the identity of the slave, it is his duty to deliver to the claimant a certificate of the proceeding had, with authority to remove the fugitive to the place from which he fled. The testimony of the fugitive is not admissible. Any assistance rendered to a fugitive to enable him to escape from the claimant, or any obstruction offered to his arrest, is penal, and also subjects the party to damages at the suit of the owner. All citizens of the United States are required, when called upon, to render the officers personal assistance in the performance of their duties. These provisions apply to all the states, or did so, at least, previously to the war, whether slavery was recognised by their special laws or not; the principle being, that 'the constitution and laws of the United States secure the right to reclaim fugitive slaves against state legislation.' In some of the slave-holding states, it is held, that if a slave from such a state go lawfully into a non-slave-holding state, and acquire a domicile there with his master, or is emancipated there by his master, he becomes emancipated, and ceases to be a slave on his return; but if he be carried there for a temporary purpose, and return, his state of slavery is resumed. These provisions have no influence on the condition of the fugitive slave (Kent, *ut sup.* ii. p. 297).

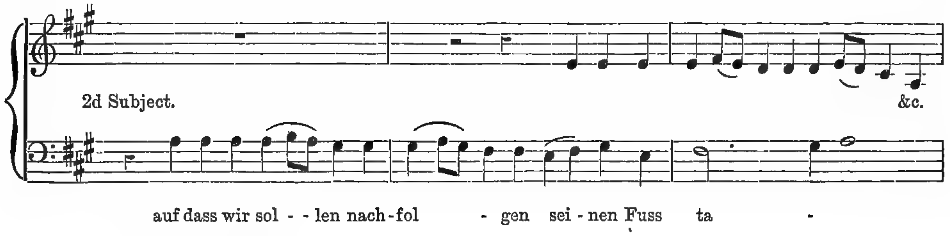
FU'GLEMAN, (properly, *Flugelman*, from the German *flügel*, a wing), an intelligent soldier posted in front of a line of men at drill, to give the time and an example of the motions in the manual and platoon exercises. He originally stood in front of the right wing, and hence the name.

FUGUE, in Music, is the name of a composition wherein the parts do not all begin at once, but follow or pursue one another at certain distances; thence the name, *Fuga*, a flight or chase, each part successively taking up the subject or melody. Any of the parts may begin the fugue, but the others follow according to fixed rules. The subject is generally a few bars of melody, which is given out in the principal key by the part which begins. The next part which enters repeats the same melody, but a fifth higher or a fourth lower, and is called the answer. The third part follows with the subject again in the principal key, but an octave higher or lower than the first part, and is answered by the fourth part in the same manner as the second part answers the first. After the subject is completed, the melody which follows it, so as to form a continuation of the part, is called the counterpoint, in the construction of which, facilities for ingenious double counterpoints of various kinds are afforded. When the subject and answer have been introduced in all the parts, the first section of the fugue is said to be completed; an intermediate harmony of a few bars then follows, sometimes in its form like part of the subject, and with a modulation into a nearly related key. The subject and answer are again brought forward, but following in a different order from the first section; while at the same time all the parts are continued, and in some of them the original counterpoint appears either simply or inverted, the subject and answer forming the predominating idea throughout the whole composition, and towards the end appearing in a variety of forms, intervals, and modifications. When the subject does not extend in compass beyond the half of an octave, the answer is invariably made in the other half; and to avoid modulation out of the key, the progression of a fifth is answered by a fourth. A fugue consisting of one subject with a counterpoint throughout, is called a strict fugue, as in the following example by J. Sebastian Bach, in which the first progression of a fifth is answered by a fourth:

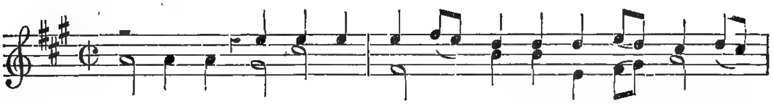


When a second subject is introduced in the middle of the composition, and afterwards worked up with the first subject, it is then called a fugue on two subjects, as in the following from Graun's *Tod Jesu:*

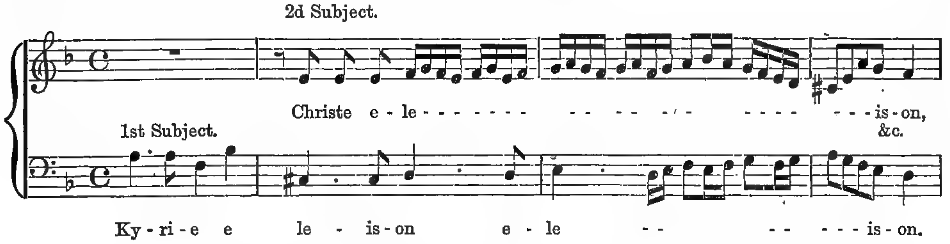




Both subjects united. &c.



A double fugue begins at once with two subjects in different parts, both of which are strictly treated throughout, as in the following from Mozart's *Requiem:*


2d Subject.
Christe e - le - - - - - - - - - - - - - - - - - - is - on,
1st Subject.
&c.
Ky - ri - e e le - is - on e - le - - - - - - - is - on.

A free fugue is that in which the subject and counterpoint are not strictly treated throughout, but mixed up with intermediate harmonies and ideas not connected with the subject, while the rules of the fugue are not rigidly adhered to.

The fugue has always been, and will continue to be, esteemed by every sound musician, not from its being the most difficult style of composition, but from its not being subject to caprice and fashion. The fugues of Bach, Handel, and other composers possess the same interest for the present time as they have done for generations past. Although the fugue is held by many to be a mere mechanical study, which can be composed or written purely by rule and calculation, still, it undoubtedly holds out to a composer of genius a wide field for great and beautiful effects, as well as peculiar artistic combinations. The best works on the fugue are by Marpurg, Albrechtsberger, Kirnberger, and the late Professor S. W. Dehn of Berlin.

FUH-HE, or **FUH-HE-SHE**, the first of the five emperors of China that flourished in the mythological period. He instructed the people in the art of rearing cattle, and invented the *pă-kwă*, or eight combinations of four strokes, to express the changes of nature. His chief invention, however, was that of letters, by drawing up the two linear tables called Ho-too and Lo-shoo, which he copied from the back of a dragon rising from the deep. According to another account, knotted cords, 20 inches long, were used for writing, till Tsang-ke, the minister of F., conceived the idea of characters from seeing the footprints of birds on the sands. F. instituted marriage, invented the musical instrument called *kin*, and taught the art of fishing. It is clear that he personifies a condition of society. He had a head with projections like the horns of an ox, and the body of a dragon.—San-tsze-king, l. 21, 22; Kang-keen-e-che-luh, i. p. 6; Gutzlaff, *Sketch of Chinese History*, i. p. 119.

FUH-KEEN, or **FU-KIAN** (Happy Established, or The Consummation of Happiness), one of the eastern maritime provinces of China. It lies to the south of Che-keang, between the parallels of 23° 35′ and 28° 47′, and is backed by the great southern range of mountains that separates South-eastern China from the inland provinces. Together with the provinces of Keang-se, Kwang-tung, and a portion of Hu-nam and Hu-pih, F. forms the hilly portion of China Proper. It is a black-tea district, and produces barley and wheat. The principal fruits are the orange, lemon, and mulberry. On its coast are situated the ports of Fu-chow (the capital), and Amoy, or Hia-mum (the gate or harbour of Hia), opened by the treaty of Nankin, 29th August 1842. See CHINA. The island of

Formosa and the Pang-hoo group are included in this province. Area, 53,480 square miles; pop. 22,699,460.

FÜHNEN (Dan., *Fyen*), the largest of the Danish islands after Seeland, is bounded on the W. by the Little Belt, which separates it from Jutland and Slesvig; on the N. by the Odensee Fjord; on the E. by the Great Belt; and on the S. by the Little Belt, and by the island of Langeland, which is incorporated with it in one circle, or *stift*, of the kingdom. The area of this province is about 1280 square miles, and the population nearly 200,000. The coast is generally rugged, and much indented with bays or fjords; but the interior is flat, except towards the south and west, where there is a range of hills rising to about 500 feet. The land, which is well watered by several small streams, is fruitful and well cultivated, producing abundant crops of cereals. Barley, oats, buckwheat, rye, flax, and hemp are grown in larger quantities than are required for home consumption. Honey is also largely exported. The F. horses are in great request, and large numbers of these animals, and of a fine breed of horned cattle, are annually sent out of the island. The province of F. is divided into the two bailiwicks of Odensee and Svendborg. The principal towns are Odensee (q. v.), Svendborg (q. v.), and Nyborg (pop. 3000), a fortified town on the east coast, and the most direct port of communication with Seeland, and memorable as having been the seat of the annual Danehof, or meeting of the States, instituted in 1354 by Valdemar IV., and for the victory gained in 1659 by the Danes and their allies over the Swedes.

FULAHS [properly, *Fúlbe* (sing. *Púllo*), called also Féllani (sing. Baféllanchi), Felláta, and Fullán], the name of a widely spread negro people in Upper Súdán, regarding whose origin there is much diversity of opinion. M. Eichwaldt (see *Journal de la Société Ethnologique*, 1841, vol. i. p. 2, et seq.) has endeavoured to connect them with the Malays in the far East, but, according to Dr Barth, 'none of his arguments are of any consequence.' Yet Dr Barth himself is of opinion that 'their origin is to be sought for in the direction of the East; but this,' he adds, 'refers to an age which for us is enveloped in impenetrable darkness.' The F. first emerge into the light of history about the beginning of the 14th c., when, as we learn from Ahmed Bábá's *History of Súdán*, two members of the tribe went on a religious mission from Melle, on the borders of Senegambia, to the king of Bórnu. The importance of this incident lies in the fact, that it shews that in the dawn of their history—as has invariably been the case in later times—the course of the tribe was from *west to east*, and also, that at the early period referred to, they were distinguished for that religious learning which still characterises them. After the 14th c., successive swarms of F. appear to have left the kingdom of Melle, or the mountainous region of Fuládu, and to have spread themselves over the greater portion of Súdán, 'absorbing and incorporating with themselves different and quite distinct national elements, which have given to their community a rather varying and undecided character.' Hence originate the conflicting accounts of travellers, some of whom speak of the F. as differing little from the negroes; others, as having their features and skulls cast in the European mould; while Bowen describes those of Yoruba as being some black, some almost white, and many of a mulatto colour, varying from dark to very bright. Many other tribes, which have not been quite absorbed by the F., are yet so far blended with them, that they have lost their native idiom altogether, and speak the language of the predominant race, which is termed the Fulfúlde. The F. are not all under one ruler; they are a *race*, not a *nation*; and have founded many kingdoms, such as those of Sókoto, Gando, Timbo, &c. The endless tribes belonging to their stock are generally divided into four groups or families, the Jel, the B'aá, the Só, and the Berí. Most of them became converted to Mohammedanism about the middle of the 18th c., and in 1802, under the Imám Othman, commenced a religious war on the surrounding pagans, which terminated prosperously in the establishment of the great Fulah empire of Sókoto. Othman died in a sort of fanatical ecstasy or madness in 1818. The F. are industrious and inclined to trade; they work iron and silver, manufacture with great neatness articles in wood and leather, and weave various durable fabrics. They are by far the most intelligent of the inhabitants of Súdán, and have, besides mosques, schools in almost all their towns.

FU'LCRUM, in Mechanics, is the prop or fixed point on which a lever moves. See LEVER.

FULDA, a town of Germany, in the electorate of Hesse-Cassel, 54 miles south of Cassel, is pleasantly situated on a rising-ground on the right bank of the Fulda, a considerable stream, which, rising from the western base of the Rhöngebirge, in Bavaria, flows northward through Hesse-Cassel, and unites with the Werra on the Hanoverian border, after a course of 110 miles. It is a pretty town, surrounded by old walls, and has a market-place, two squares, and eight suburbs. One of the chief buildings is the cathedral, the fourth church that has been built on this site. It is a handsome modern structure, and covers the shrine in which the body of St Bonifacius was deposited after his murder by the Frisians in 754. The other notable structures are the palace, formerly the residence of the prince-bishops of F.; the church of St Michael, founded in 822; a gymnasium, schools of art and manufactures, and a public library. F. has acquired a reputation for its linen manufactures; it has also extensive establishments for the manufacture of vinegar and beer; with dye-works, tanneries, and weaving. Pop. 14,000, mostly Roman Catholics. The province of Fulda, of which F. is the capital, forms part of what was formerly the grand-duchy of Fulda. This territory was incorporated with the grand-duchy of Frankfurt by Napoleon in 1810, and ceded to Prussia in 1815, but immediately afterwards was made over to Hesse-Cassel.

FU'LGORA. See LANTERN-FLY.

FU'LGURITES (Lat., *fulgur*, lightning), tubes formed of vitrified sand, which are found in sandbanks, and in soils consisting chiefly of silicious sand, and are attributed to the action of lightning melting and vitrifying the sand. They were first discovered in 1711 by the pastor Herman, at Massel, in Silesia, and have since been found in many places; but their origin was first pointed out by Dr Hentzen in 1805. They are from a quarter of an inch to two inches and a half in diameter, their internal surface of a perfectly glassy substance, hard enough to scratch glass, and to give fire with steel. They are usually, but not always, placed vertically in the sand, become narrower downwards, and sometimes divide and subdivide into branches.—The effects of lightning seem to be exhibited also in some places on rocks by vitrification and the production of a sort of enamel, sometimes assuming the form of beads.

FULHAM, formerly a village, but now a suburb of London, in the south of Middlesex, on the left bank of the Thames, six miles south-west of St Paul's.

FU'LICA. See COOT.

FULI'GULA. See POCHARD.

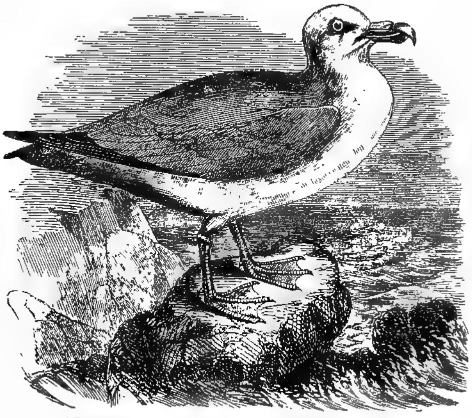
FULLER, ANDREW, an eminent Baptist minister, and theological and controversial writer, the son of a small farmer, was born at Wicken, Cambridgeshire, February 6, 1754. He received the rudiments of his education at the free school of Soham, and in his youth was principally engaged in agricultural labours. In his 17th year, he became a member of a Baptist church at Soham, and in 1775 he was chosen pastor of a congregation at that place. His small stipend of £21 per annum he endeavoured to increase by keeping, first a small shop, and then a school. In 1782, he removed to Kettering, Northamptonshire, to take the pastorate of a congregation there. On the formation, in 1792, of the Baptist Missionary Society by Dr Carey, himself, and eleven other ministers, he was appointed its secretary, and the whole of his future life was devoted to the administration of its affairs. In 1794 he published a controversial treatise, entitled *The Calvinistic and Socinian Systems, examined and compared as to their Moral Tendency* (Lond. 8vo). This work was attacked by Dr Toulmin and Mr Kentish, and F. replied in a pamphlet, entitled *Socinianism Indefensible* (Lond. 1797, 8vo). His other principal publications are *The Gospel its own Witness* (Clipstone, 1797), and *Expository Discourse on the Book of Genesis* (2 vols. 8vo, Lond. 1806). He was also the author of a variety of single sermons and pamphlets. The sense, sagacity, and thoroughly practical knowledge of mankind which these writings display, have won for F. the title of 'the Franklin of Theology.' He died May 7, 1815. Three collected editions of his works have been published, besides American reprints; the first in 10 vols. 8vo, the second in 5, and the third in 1 royal 8vo. A volume of his treatises was republished in Bohn's Standard Library, with a Memoir by his son. F.'s *Memoir of the Rev. Samuel Pearce of Birmingham* is much esteemed as a religious biography.

FULLER, SARAH MARGARET, MARCHIONESS OSSOLI, an American lady, whose talents, rare individuality of character, and untimely death, give to her history a peculiar and tragic interest, was born at Cambridgeport, in Massachusetts, in 1810. Under the care of her father, a lawyer and member of Congress, she was early and thoroughly instructed in the classics. It is related that he used to say of her, while still a child, that she 'knew more Latin and Greek than half the professors.' At a very early age, she had also made great proficiency in French and Italian. After the death of her father in 1835, she became teacher of languages in Boston, and subsequently principal of a school at Providence, Rhode Island. In 1839, she published a translation of Eckermann's *Conversations with Goethe.* She became, in 1840, editor of the *Dial*, a periodical instituted for the advocacy and diffusion of Transcendentalism in America, and for which she wrote a number of admirable articles on literature and art. Her *critique* on Goethe especially, in the second volume of the *Dial*, has been greatly and deservedly praised. 'Nowhere,' says Mr Emerson, 'did Goethe find a braver, more intelligent, or more sympathetic reader.' Her *Summer on the Lakes*, a vivid and truthful picture of prairie-life, was published in 1843. Soon after, she took charge of the literary department of the *New York Tribune.* In 1846, she visited England, where she made the acquaintance of Carlyle and other eminent men. From London, she journeyed through France to Italy. At Rome, she accidentally became acquainted with the Marquis Ossoli, to whom, though many years younger than herself, she was married in December 1847. She took the deepest interest in the cause of Italian liberty; and during the siege of Rome, in 1849, devoted herself with untiring assiduity to the care of the sick and wounded. In May 1850, she and her husband set sail for America; but a violent storm having arisen when they were near the coast of the United States, the vessel struck on Fire Island Beach, Long Island, in the morning of the 16th of July, and a few hours after went to pieces. Among those who perished were the Marquis and Marchioness Ossoli and their child.

FULLER, THOMAS, D.D., an eminent English historian and divine, was born in 1608 at Aldwinkle, Northamptonshire, of which parish his father was rector. He was educated at Queen's College, Cambridge, and greatly distinguished himself by his application to study. He took the degree of A.B. in 1624, and that of A.M. in 1628. He stood so high in the estimation of his college that, before he was 23 years of age, he was appointed to St Benets, Cambridge, and acquired great popularity as a preacher. Soon after, he was collated to a prebend in Salisbury Cathedral, and obtained a fellowship in Sidney Sussex College. His first publication was a poem, entitled *David's Heinous Sin, Hearty Repentance, and Heavy Punishments* (1631, 8vo). He was next presented to the rectory of Broad Windsor, Dorsetshire; published his *History of the Holy War* at Cambridge in 1639; and in 1640 removed to London, where he was chosen lecturer at the Savoy Church in the Strand. The same year, he was a member of the Convocation at Westminster, and one of the select committee appointed to draw up new canons for the better government of the church. During the civil war he adhered firmly to the royal cause; and shared in its reverses. In 1646, however, he was chosen lecturer, first, at St Clement's Lane, Lombard Street, and afterwards at St Bride's. About 1648, he was presented to the living of Waltham, in Essex. In 1650, he published a geographical account of the Holy Land, entitled *A Pisgah Sight of Palestine and the Confines thereof* (folio, with maps and views), and *Abel Redivivus*, a collection of lives of modern divines. In 1655, he published at London *The Church History of Britain, from the Birth of Jesus Christ until the year* 1648 (folio). In 1658, he received the living of Cranford, Middlesex, and at the Restoration he was reinstated in his prebend of Salisbury, of which he had been deprived by the Parliamentarians. He was also appointed chaplain extraordinary to the king, and created D.D. at Cambridge by royal mandamus. He died August 16, 1661. His principal work, *The Worthies of England*, was published at London in 1662 (folio). Valuable for the information it contains on provincial history, it abounds in biographical anecdote, witty remark, and acute observation on men and manners. A new edition, with his life prefixed, appeared in 1810 (2 vols. 4to). His *Holy and Profane States* were republished in America in 1831. Quaint humour is one of F.'s peculiar characteristics; but his writings are no less remarkable for wisdom, imagination, and, when occasion demands, even for pathos. 'Next to Shakspeare,' says Coleridge, 'I am not certain whether Thomas Fuller, beyond all other writers, does not excite in me the sense and emulation of the marvellous. . . . He was incomparably the most sensible, the least prejudiced great man, in an age that boasted of a galaxy of great men.'

FULLER'S EARTH, a mineral consisting chiefly of silica, alumina, and water, with a little magnesia, lime, and peroxide of iron. The silica is about 50, the alumina 20, and the water 24 per cent. of the whole. It is regarded as essentially a hydrous bisilicate of alumina. It occurs in beds, associated with chalk, oolite, &c.; is usually of a greenish-brown or a slate-blue colour, sometimes white; has an uneven earthy fracture, and a dull appearance; its specific gravity is from 1·8 to 2·2; it is soft enough to yield readily to the nail; is very greasy to the touch; scarcely adheres to the tongue; falls to pieces in water, but does not become plastic. It has a remarkable power of absorbing oil or grease; and was formerly very much used for fulling cloth (see WOOLLEN MANUFACTURE), for which purpose it was considered so valuable, that the exportation of it from England was prohibited under severe penalties; it is still used to a considerable extent. The annual consumption in England is said to have at one time exceeded 6000 tons. It is found at Nutfield, near Reigate, in Surrey, in cretaceous strata; where there are two distinct beds, the upper one of a greenish colour, and 5 feet thick, resting on the other, which has a bluish tint, and is 11 feet thick. It is also found in Bedfordshire, Nottinghamshire, and Kent; and on the continent in Saxony, Bohemia, and near Aix-la-Chapelle. There is a considerable deposit of it at Bath, where the group of associated blue and yellow clays and marl has received the name of 'the Fuller's Earth Series.' It is also found at Maxton, in Scotland.

FULMAR, or FULMAR PETREL (*Procellaria* or *Fulmarus*), a genus of birds generally referred to the gull family (*Laridæ*), and containing some of the most strictly oceanic birds. See PETREL. The bill is not longer than the head—large, strong, and subcylindrical; the upper mandible suddenly hooked at the point; the lower mandible with the tip curved upwards; the tips of both mandibles appearing as separate pieces firmly joined to the straight part of the bill, which is marked by longitudinal grooves; the nostrils enclosed in a tube open at the extremity, and extending along the ridge of the upper mandible. The tarsi are compressed; the hind-toe rudimentary, a mere claw. The tail is short, and slightly rounded; the wings are long.—The COMMON or NORTHERN F. (*P.* or *F. glacialis*) is a bird about the size of a duck, gray above, white beneath, the head and neck pure white, the tail white, the bill yellow; the young brownish gray. It inhabits the most northern seas, in which its numbers are prodigious; breeds on the rocky shores of the Faröe Islands, Iceland, Greenland, Spitzbergen, &c., on the grassy shelves of the precipices, making a slight nest or a mere excavation, in which it lays one egg. It is rarely to be seen on the southern coasts of Britain, but more frequently in Orkney and Shetland, where, however, it is said never to breed, although it breeds in great numbers in St Kilda and the adjacent islets of Borrera and Soa. It frequents these isles in vast numbers, and is of great importance to the inhabitants of St Kilda, who esteem its eggs above those of any other bird, and seek them in the most perilous manner, descending by ropes from the summit of the precipices. The fulmars are also valued for their feathers, for their down, and for their oil, which is one of the principal products of St Kilda, and is obtained from their stomachs. The old are said to feed the young with it; and when they are caught or assailed, generally lighten themselves by disgorging it. It is amber-coloured, and has a peculiar and very disagreeable odour. Fulmars feed on all animal substances which come in their way, giving an evident preference to fat, and delighting in the blubber of whales. They pursue whales to prey on the cirrhopods which are attached to them, or imbedded in their skin. Multitudes of them soon gather around a dead whale, and they are so bold as to advance within a few yards of the men who are cutting it up. When food is abundant, they often glut themselves till they are unable to fly. They follow the greasy track of a whaler, and, indeed, some of them are always in attendance on ships immediately after they pass north of the Shetland Islands, ready to seize any garbage that may be thrown overboard. Sailor-boys often amuse themselves in catching them by means of lines and hooks baited with fat.



Northern Fulmar (*Procellaria glacialis*).

Another species of F. (*P.* or *F. Pacifica*) exists in the Pacific Ocean, and the MOTHER CAREY'S GOOSE of sailors, a large bird of the southern seas, is sometimes referred to the same genus.

FU'LMINATE OF MERCURY, or FULMINATING MERCURY ($2HgO,C_4N_2O_2$), is best prepared by dissolving 3 parts of mercury in 36 of nitric acid of specific gravity 1·34, without the application of heat, in a flask capable of holding 18 times the bulk of the acid. The solution is then to be poured into a large vessel containing 17 parts of alcohol of specific gravity 0·830, and immediately to be re-transferred to the flask, which is still full of nitrous vapours, and with which it must be well shaken, in order to effect their absorption. Effervescence commences in a few minutes, and soon becomes extremely violent; and at the same time there is a deposit of metallic mercury, which is gradually re-dissolved. The reaction must be moderated by the gradual addition of 17 parts more of alcohol; and on cooling, crystals of the fulminate, amounting to 4·6 parts, are deposited. These must be washed with cold water, and dried at 100° F. Fulminate of mercury forms white silky needles. It may be handled without much danger when moist; but when dry, it explodes with violence when struck by a hard body, or when touched with nitric or strong sulphuric acid. A mixture of 1 part of this salt with 6 parts of nitre, or of 3 parts of the fulminate, 5 of chlorate of potash, 1 of sulphur, and 1 of ground glass, is employed as the priming of percussion-caps. It is applied as a dry powder, and is made to adhere to the cap by the application of a drop of shell-lac varnish.

FULMINATE OF SILVER, or FULMINATING SILVER ($2AgO,C_4N_2O_2$), is prepared in nearly the same manner as the fulminate of mercury.

It is more powerfully explosive than the last-named salt. Even when moist or under water, pressure with a hard body will cause its explosion; and when quite dry, the slightest friction between two hard bodies produces a similar result.

The preparation of the fulminates is attended with very considerable danger, and should be attempted by none but professed chemists.

FULMI'NIC ACID has never been isolated in the hydrated form, but from the composition of its salts, its formula doubtless is $2HO,C_4N_2O_2$. It is thus isomeric with cyanic acid. Fulminic acid may be separated from the oxide of mercury and silver, and combined with other bases, such as potash; and all such compounds are more or less explosive.

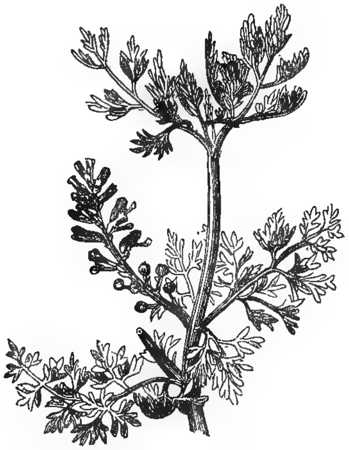
FULTON, ROBERT, a celebrated American engineer and inventor, born near Lancaster, in Pennsylvania, in 1765. When a mere child, he manifested that taste for mechanics which he cultivated with so much success in after-life. While other boys of his age were engaged in play, he found his amusement in visiting the workshops of Lancaster. When he was about seventeen years of age, he set up as a painter of portraits and landscapes in Philadelphia; he was so successful, that he not only supported himself and his widowed mother, but was able, in a few years, to lay by a sum sufficient to purchase a small farm. In 1786, he visited London, where he pursued the study of his art under the tuition of his celebrated countryman, West. He afterwards resided for some time in Devonshire, and became acquainted with the Duke of Bridgewater and Lord Stanhope, through whose influence, as it would appear, his attention was turned from his former pursuit to mechanics and civil engineering. In 1793, he was associated in a project to improve inland navigation: he was already familiar with the idea of using steam as a propelling power for boats. About this time, he invented a machine for spinning flax, and another for making ropes, for which he obtained patents in England. In 1796, he published a treatise on the improvement of canal navigation. From 1797 to 1804, he resided in Paris with Mr Joel Barlow, the American representative at the French court. During this period, he invented a submarine or plunging boat, called a *Torpedo*, designed to be used in naval warfare. He invited the attention of the French government to his invention, and Bonaparte, then First Consul, appointed Volney, La Place, and Monge as a commission to examine it. Several experiments were made in 1801 in the harbour of Brest. He could easily descend to any depth, or rise to the surface; and where there was no strong current, the boat was quite obedient to her helm while under water. On one occasion, he remained in the torpedo several feet below the surface for more than four hours; but the motion of the boat while submerged was very slow, and it was clearly unequal to the stemming of a strong current. The French government declined to patronise the project, and F. accepted an invitation from the English ministry, who also appointed a commission to test the merits of his torpedo. He appears, however, to have received but little encouragement, and in 1806 he returned to the United States. Having been supplied with the necessary funds by Robert Livingston, who had been American ambassador at Paris, F. had the satisfaction of proving, in 1807, that steam could be applied to the propulsion of vessels with entire success. His achievement excited universal admiration, and from that time steamboats were rapidly multiplied on the waters of the United States. His first boat, the *Clermont*, made regular trips between New York and Albany at the rate of five miles an hour; but this rate was soon increased by improved machinery. F. had married, in 1806, Harriet, the daughter of Walter Livingston. In the midst of his triumphs and in the height of his fame, he died, on the 24th of February 1815. He left four children.

Others had previously conceived the idea of using the power of steam in navigation, and as early as 1789, a steam-boat 60 feet long, which sailed at the rate of seven miles an hour, had been tried on the Forth and Clyde Canal, and was abandoned through fear that the undulation produced by it would injure the banks of the Canal. See STEAM NAVIGATION. This experiment was known to F.; but to him is unquestionably due the credit of being the first to carry the idea into practice with complete success.

FUM, or, more properly, **FUNG**—the first being the Portuguese pronunciation of the word; the Chinese Phœnix—one of the four symbolical animals supposed to preside over the destinies of the Chinese empire. Its appearance indicates an age of universal virtue, the influence of which has extended throughout creation. It is supposed to originate from the element of fire, and to be born in the Tan-heuĕ, or Hill of the Fiery Halo of the Sun; to have the forepart of a goose, hind-quarters of a stag, neck of a snake, fish's tail, fowl's forehead, down of a duck, dragon's marks, the back of a tortoise, face of a swallow, and beak of a cock, with beak, claws, and feathers of various colours, red crest, and golden beak. It is about six cubits high, and comes from the East. In mystical language, it is called the Leĭh-kwan, or 'mandarin of time,' and it is said to have a forehead like heaven, eyes like the sun, back like the moon, wings like the wind, feet like earth, and a tail like the planets. On its body are inscribed the five cardinal virtues. According to some authors, it only perches on the woo-tung tree, and eats the seeds of the bamboo; others describe it as swallowing small carp. Other accounts say it eats no living insect, and treads on no growing plant. Its voice is said to be like a flute, drum, or even thunder. When seen, it is followed by birds. According to Chinese history, it has occasionally appeared; and a celebrated female flute-player, named Lung-yu, is said to have enticed it from heaven with her music, and then fled away with it. Like the phœnix of the Egyptians and roc of the Arabs, the bird may have had a historical origin, subsequently disfigured by fiction. It is often represented on Chinese works of art, under the form of a gallinaceous bird, and is embroidered on the dresses of mandarins of a certain rank. It is mentioned by some modern English poets.—Kidd, *History of China*, p. 267; Ching-tsze-tung, 172 sect.; Yuen-keen-luy-han, 148 sect.

FU'MAGE, in the Law of England, was properly smoke-farthings, or a customary payment for every house that had a chimney or fire-hearth. This tax is mentioned in Domesday as paid by custom to the king for every chimney in the house. Edward the Black Prince is said to have imposed a tax of a florin for every hearth in his French dominions. The first statutory enactment on the subject in England is by 13 and 14 Car. II. c. 10, whereby a tax of 2*s*. on every hearth in all houses paying to church and poor was granted to the king for ever. This tax was abolished 1 William and Mary, st. 1. c. 10.

FUMARIA'CEÆ, a natural order of exogenous plants; herbaceous, with a watery juice; their leaves alternate, much divided; the calyx of two deciduous sepals; the corolla of four very irregular petals; the stamens sometimes four and distinct, more generally six and in two bundles; the ovary free, one-celled, one-seeded, or many-seeded; the seeds having large albumen. The F. are regarded as in their botanical characters approaching most nearly to the *Papaveraceæ* (Poppy, &c.); but their general aspect is very different, and they do not possess the same powerful properties. Both the foliage and flowers of some have considerable beauty. *Dielytra spectabilis* is a well-known favourite in gardens and green-houses. More than one hundred species are known, mostly natives of temperate climates in the northern hemisphere. Several species of *Fumaria* and *Corydalis* are natives of Britain. The COMMON FUMITORY (*Fumaria officinalis*) is a very frequent weed in gardens and cornfields, but of rather delicate and beautiful appearance. It is annual, and easy of extirpation, where it springs up in excessive abundance. It was formerly much employed in medicine, having a high reputation as a tonic and diaphoretic, and although disused in Britain, is still esteemed in France as a remedy in scorbutic affections, chronic eruptions, &c. Some of the other species of fumitory possess similar properties. The leaves have an intensely bitter saline taste.



Common Fumitory (*Fumaria officinalis*).

FUMA'RIC ACID, known also as Boletic Acid ($2HO,C_8H_2O_6$), is of frequent occurrence in the vegetable kingdom. It was first obtained by Braconnot from a species of boletus, and has since been found in many other fungi, in numerous lichens, in various species of Fumaria, in Corydalis bulbosa, &c.

Fumaric acid may also be obtained, in association with malæic acid, by heating Malic Acid (q. v.) to 350° F.

It crystallises in prisms, which have a very acid taste, are only slightly soluble in water, but dissolve readily in alcohol and ether. At a temperature of 392° F., it volatilises without fusing, and is converted into the malæic acid already mentioned, which possesses the same composition as fumaric acid, but different properties. If malæic acid is exposed for a long time to a temperature of 266°, it again passes into fumaric acid, so that these acids are mutually convertible.

Kekulé has recently shewn (*Annalen d. Chemie*, 1861) that both fumaric acid and malæic acid combine directly with bromine, and produce crystals of dibromo-succinic acid; and further, that if fumaric acid be dissolved in water, and digested with an amalgam of sodium, the nascent hydrogen from the decomposed water combines with the acid, and converts it into succinic acid. Its compounds are of no special interest.

FU'MIGATING PA'STILS are composed of various ingredients, which, by their smouldering combustion, evolve agreeable odours. The following recipe for their composition is given in the Würtemberg Pharmacopœia: Take of benzoin and dry balsam of Peru, each 16 parts; of yellow sandalwood, 4 parts; of labdanum, 1 part; of charcoal from lime-tree wood, 96 parts; of nitrate of potash, 2 parts; and of mucilage of tragacanth, enough to form the mixture into a paste, from which conical pastils are to be made by a small mould.

The 'Ribbon of Bruges' is also employed for aromatic fumigation in the same manner as pastils. It is prepared as follows: Dissolve two ounces of nitrate of potash in a pint of water; in this fluid, steep good undressed cotton-tape, and hang it up to dry. Prepare a tincture composed of spirit, half a pint; musk, half an ounce; otto of roses, one drachm; benzoin, four ounces; myrrh, half an ounce; orris-root, half a pound. When this tincture has stood for a month, steep the prepared tape in it. The tape when dried is fit for use. Light it, blow out the flame; and as it smoulders, a fragrant vapour will rise into the air. For further information on this and allied subjects, see Piesse's *Art of Perfumery*.

FUMIGA'TION (Lat. *fumigatio*, from *fumus*, smoke), the cleansing or medicating of the air of an apartment by means of vapours, employed chiefly for the purpose of detaching infectious poisons from clothing, furniture, &c. See CONTAGION, INFECTION. Most of the methods of fumigation formerly employed have little real value, and are to be looked on chiefly as grateful to the senses; as, for instance, the burning of frankincense, camphor, &c. The really active processes are noticed under the article DISINFECTANTS.

FUNCHA'L, the capital and the only town of the island of Madeira (q. v.), is situated on the south side of the island, and consists chiefly of one street, extending for about a mile along the shore, and of numerous streets and lanes at right angles with the main street, and leading up the hill which backs the town. Its roadstead is open, and its anchorage rocky and uneven. F. has a cathedral, numerous churches, and small convents, and is defended by four forts. From it all the produce of the island is exported.

FUNCTIONS, a mathematical term. When two or more variables are combined with constants in an equation, and are such that a change of value of one implies a corresponding change of value of one or more of the others, then such variables are said to depend on, and to be functions of each other; and the expression of the mode of dependence is said to be a *function* of such variables. If such an expression involves but one variable, it is said to be a function of one variable; if two are involved, to be a function of two variables; and so on. Thus $\sin x$, e^{ax}, $\log. x$, $\sqrt{a^2 - x^2}$ are functions of one variable—viz. of x; $e^{ax + by}$, $\text{Tan}\,(ax + by)$, x^y, are functions of two variables, x and y; so xyz, $x^2 + y^2 + z^2$ are functions of three variables, and so on. Functions are denoted by the symbols F, f, φ, ψ, &c. Thus $F(x)$ means a function of one variable, x, combined with constants or not, as the case may be; $\psi(xyz)$ a function of three variables. These functional symbols are *general*, and their specific forms are the particular functions which arise from operations in algebra, trigonometry, &c.

Functions are implicit or explicit. When one variable is expressed in terms of others, it is said to be an explicit function of them; but when all the variables remain involved in one expression, the function is said to be implicit. Thus, $x^2 + y^2 - r^2 = o$ is an implicit function of two variables, but $y = \sqrt{r^2 - x^2}$ is an explicit function of one variable. In explicit functions, the variable which is expressed in terms of the others is called the *dependent* variable, and the others the *independent* variables. Explicit functions are usually written in the form $z = f(xy)$; implicit in the form $u = F(xyz) = o$. Functions, again, are algebraical or transcendental. Algebraical functions are those which involve the operations of addition, subtraction, &c., and of involution and evolution. Transcendental functions are those where the operations symbolised are such as e^x, $\log_e. x$, $\sin x$, &c.—i. e., exponential, logarithmic, or circular. Functions, also, are simple or compound according as they involve one or several operations. $y = \sin x$ is a simple function; but $y = \log. \sin x$ is compound. Further, functions are divided into the continuous and the discontinuous, the circulating and the periodic. Continuous functions are such as are subject to the following conditions: 1. As the variable gradually changes, the function must gradually change; 2. The law symbolised by the functional character must not abruptly change. Circulating functions are those whose values lie within certain limits for all values of the variables. $y = \sin x$ is an example at once of a continuous and of a circulating function. A function is said to be periodic when it takes the form $f^n(x) = x$, signifying that if on x the operation f be performed n times, the resulting value will be x. Thus, $f(x) = \frac{1}{1 - x}$ is a periodic function of the third order. For performing the operation indicated by f the second time on $\frac{1}{1 - x}$ as the variable, we have $f^2(x) = \frac{1}{1 - \frac{1}{1 - x}} = -\frac{1 - x}{x}$; and the third time we have $f^3(x) = \frac{1}{1 - \left(\frac{1 - x}{x}\right)} = x$. The functional calculus is a recent growth of the transcendental analysis. The object of the Differential Calculus (q. v.) is generally to ascertain the changes in functions arising from the continuous and infinitesimal variation of their subject variables. The object of the new functional calculus is, speaking generally, to investigate the forms of functions and their growth, when they are subject to a continuous and infinitesimal change as to form. According to Mr Price (treatise on the Infinitesimal Calculus), as the differential calculus investigates properties of continuous numbers, so does the new calculus the properties of continuous functions; and as there is an integral calculus of numbers, so there is an inverse calculus of functions. Of the new calculus, the Calculus of Variations (q. v.) may be considered the main branch. It includes, of course, the subject of functional equations. Functional equations are those in which it is required to determine from equations the forms of functions entering them: e. g., what is the function of x and y which satisfies the equation $f(x) \times f(y) = f(x + y)$? See article CALCULUS OF FUNCTIONS in the *Encyclopædia Metropolitana*.

FUND, FUNDING SYSTEM. Fund (Lat. *fundus*, ground, foundation) means a supply of money or a source whence money may be obtained. When we speak of 'the funds' in this country, we mean that great organisation for buying and selling the right to become a public creditor, and receive a share of the interest of the national debt. See DEBT, NATIONAL. When money has in this country been borrowed for public purposes, and it has been found that it cannot be repaid as a temporary loan, the resolution to hold it as a perpetual loan at a certain interest has been called 'funding' it; and hence we read from time to time that certain obligations were converted from floating into funded debts.

FUND, SINKING, a plan pursued for a considerable period for the purpose of collecting money for the payment of the national debt of Great Britain. It was begun in 1716 by Sir Robert Walpole. Certain taxes which had previously been laid on for limited periods were then rendered perpetual, for the purpose of paying the interest of the funded debt. They produced more than enough for this purpose, and the surplus was laid aside, that it might accumulate into a fund for extinguishing the debt. It appeared to operate well, since, in 1728, after it had existed for twelve years, debt was wiped off to the extent of £6,648,000. It was not observed that, during the wiping off, new debt had been created to about the same extent, so that the nation was just in the position in which it would have been had it neither borrowed nor repaid. It is supposed that Sir Robert may have seen the fallacy of the sinking fund, since in 1732 he took half a million from it to meet the expenditure of the year, instead of raising a new loan. It was in 1786, however, that the system was established on a great scale by the younger Pitt, who, notwithstanding his great practical abilities, was entirely misled by the theories of Dr Price in his work on Annuities. The system continued to be conducted on an enormous scale, until another student of economy and figures conclusively proved it to be useless; this was accomplished in 1813 by Dr Hamilton, in his *Inquiry concerning the Rise and Progress, the Redemption and Present State, and the Management of the National Debt of Great Britain.* The fallacy which Dr Hamilton shewed to pervade a sinking fund may be best explained by a simple example. Suppose that one requires to borrow £100, and lays by £5 a year as a fund to pay it up with. Accumulating at compound interest, this fund will pay back the loan in about fifteen years. The borrower will, however, gain no more by the process than if he paid the £5 a year to his creditor, for his debt would be diminishing to precisely the same extent as the fund to pay it off would be increasing. Suppose that while requiring only £100, the borrower raises £200, and lends out one of them, accumulating the interest until the whole amounts to £200; the borrower will no doubt be receiving interest on £100, but he will be at the same time paying interest on £200; and he would repay his debt at the same cost and with more simplicity if, instead of borrowing the second hundred at 5 per cent., he paid over £5 a year to his creditor. In these instances, nothing is lost by the sinking fund. But suppose that in the last case the creditor had agreed to lend the £100 at 5 per cent., but in consideration of the greater risk, would not lend the £200 at less than 6 per cent., while the borrower can only get 5 per cent. for the half which he relends—here the transaction would cause a dead loss of £2 a year over the plan of repaying by instalments. This was exactly the case with the British sinking fund. The more money the chancellor of the exchequer wanted, the higher were the terms demanded by the lenders, and the addition to each loan for setting aside a sinking fund increased the rate of interest paid on it.

FUNDAME'NTAL BASS, in Music, is the root or fundamental note of the harmony. See Harmony.

FUNDI, or **FUNDUNGI** (*Paspalum exile*), a kind of grain much cultivated in the west of Africa. It is allied to the millets, and still more nearly to some of the kinds of grain cultivated in India. See Paspalum. It is wholesome and nutritious, and has been recommended to attention in Britain as a light and delicate food for invalids. The natives of Western Africa throw it into boiling water, pour off the water, and add palm-oil, butter, or milk. By Europeans and negroes in Sierra Leone, it is much used with stewed meat, and sometimes made into porridge with milk.

FUNDY, Bay of, an arm of the Atlantic, separates Nova Scotia from New Brunswick and the state of Maine. With an average breadth of 35 miles, it extends 180 miles in length from north-east to south-west. It forks, at its head, into two inlets, the northern, called Chignecto Bay, and the southern, Minas Channel, which are divided by narrow necks of land from the Gulf of St Lawrence. Along its north-west side, reckoning downwards, it receives the St John, which is the principal river of New Brunswick, and the St Croix, which, through its entire course, forms the international boundary. The navigation is rendered perilous by the peculiarity of the tides, which are said to rise and fall fully 70 feet.

FUNERAL EXPENSES, in Law. If limited to the degree and quality of the deceased, funeral expenses are a privileged debt, allowed before all other debts and charges, both in England (3 *Inst.* 202) and in Scotland (Stair, iv. 35, 3). If the parties primarily liable neglect the duty of giving decent burial to the dead, a stranger may do so, and claim reimbursement out of his effects before all others having right, whether heirs or executors. The amount of expenditure which a court of law will consider reasonable varies so entirely with the circumstances, that it is needless to attempt to define it otherwise than by saying that it must be in accordance with common custom and common sense. In Scotland, it is held (Buchanan *v.* Ferrier, 14th February 1822) that mourning for the widow and such of the children of the deceased as were present at the funeral is a valid charge; but the reverse is the case in England, it having been decided (Johnson *v.* Baker, 2 C. and P. 207) that the widow has no claim for mournings either against the executor or the creditors of her husband. All along there seems to have been rather greater liberality in this matter in Scotland than in England, where Lord Holt held that nothing was allowable against a creditor except for the coffin, ringing the bell, parson and clerk (1 Salk. 296).

FUNERAL RITES. The methods of disposing of the dead have been so various, and connected with so many ceremonial observances dictated by affection, religious conviction, or superstition, that a full consideration of the subject would occupy a volume. Under the article Burial will be found a description of the principal modes of interment, and the accompanying funeral rites of the ancients.

With the spread of Christianity came the decorous interring of the dead with religious ceremonials indicative of hopes of a blessed resurrection. From the moment of death until interment, the body is the object of solemn ceremonial in the Roman Catholic Church. At death, a crucifix is placed in the hand, or at the feet, and holy-water is sprinkled. The chief funeral rites are solemnised in the church, into which the coffin is borne and placed on a bier. Throughout France, the Netherlands, and continental Europe generally, the ordinary cortège of a funeral is a hearse with a bier, on which is the coffin, covered with a pall, followed by carriages all in black, with black horses. The same arrangement is pursued in England, but the hearse, sometimes over-decorated with dark plumes, is closed instead of being open. In the more common class of funerals, the coffin, shrouded in a pall, is borne on spokes, or on the shoulders of bearers. All the attendants are in black. A certain etiquette as to pall-bearers (parties who hold ribbons attached to the pall) is observed; the relatives of the deceased taking their place nearest the head in the degree of consanguinity, and the same arrangement is maintained in lowering the coffin by cords into the grave. Only in exceptional cases are bodies put in leaden coffins and deposited in vaults; the common sense of the people now appreciating the propriety of allowing corpses to dissolve and mingle with the earth of the grave; and for this practice, the numerous new cemeteries offer facilities. Scottish Presbyterians, as is the case with some English dissenters, have no funeral-service, unless we reckon as such a prayer, and occasionally the reading of a chapter of Scripture, by a clergyman before the body is borne from the house; but in other respects the Scottish ceremonial differs little from the English. Formerly, in the case of important personages, the hearse was preceded by a class of undertaker's men to clear the way, designated *saulies*, and gumpheon-men—these last bearing a pole shrouded at the top with black silk, called a gumpheon (*gonfalone*, a banner), being a relic of an ancient heraldic ceremonial; but this custom has nearly, if not altogether, disappeared. At Scotch funerals, the relatives, and in some cases the friends of the deceased, wear white cambric *weepers* at the wrists. Till within the present century, there was a practice of giving a series of expensive entertainments to guests at Scottish funerals, beginning with the *lykwake*, and ending with the *dredgy* (dirge); but all this is gone, or nearly so. The giving of costly entertainments was not, however, confined to Scotland, or to Ireland. Taking its rise in ancient customs which were perpetuated by the Anglo-Saxons, the practice of consuming meat and drink in a species of gloomy festivity at funerals was common in England, and carried to an extravagant length at the decease of persons of distinction, on which occasion Doles (q. v.) were also given. It had even its counterpart in the usages of the ancients. The *nekrodeipnon*, or funeral-banquet, is mentioned by Lucian and Cicero. It was always celebrated in the house of the nearest relative of the deceased, and Demosthenes, the patriot orator of Greece, tells us in his Oration, *On the Crown*, that the relatives of those who were slain at Chaeroneia, were entertained by him in his own mansion, as if he were the nearest kinsman of the fallen heroes. The *nekrodeipnon* is often represented on funeral monuments. For some curious information respecting old funeral entertainments, we refer to Brand's *Popular Antiquities*, edited by Ellis. Without losing as regards decorum, funeral arrangements have been greatly cheapened in most large towns in England and Scotland by means of funeral-conducting establishments belonging to societies or private speculators.

W. C.

FÜNFKIRCHEN ('Five Churches;' Hungarian, *Pecs*), an important town of Hungary, capital of the county of Baranya, is situated on the southern slope of the Mecseg Mountains, near the Slavonian boundary, 105 miles south-south-west of Pesth. It is the seat of a bishop, and is one of the oldest, as well as one of the most pleasantly situated and beautiful towns of Hungary. It formerly possessed a university. The most important of its buildings are the large and imposing cathedral, the bishop's palace, an Italian structure, the town-house, lyceum, gymnasium, seminary, and the churches, which are numerous and beautiful. It has important tanneries, woollen and flannel weaving and silk-spinning; produces wine, fruit, and tobacco, has coal-mines and ironworks, and a flourishing trade in hogs and gall-nuts. Pop. 15,900.

FUNGI, an order of acotyledonous or cryptogamous plants, containing a very great number of species, nearly 5000 being known, whilst it is probable that the whole number existing is very much greater. They are amongst the lowest forms of vegetable life, and some naturalists of no mean reputation have entertained the notion that they spring into existence in certain circumstances, not from germs previously existing, but from a mucus capable of organisation, or through changes in the cells of more highly organised plants, and of animals in states of disease or of decay; an opinion which, however, is more generally rejected as having no foundation in accurate observation, as not necessary to explain the readiness with which certain fungi almost invariably spring up in certain circumstances—from which is derived the chief argument in its favour, as opposed to all analogy of ascertained facts, and as rendered improbable by the abundant provision which all the fungi possess for the perpetuation and diffusion of the species. Fungi are cellular plants, the cells sometimes elongated so as to become filaments. They consist of a *thallus*, which spreads in a matrix, and is nourished by it, and from which stems are thrown up into the air, bearing the fructification. The organs connected with fructification are often the principal part of fungi, and the thallus very small, consisting of a few cottony threads, or closely compacted cells, or even altogether undiscernible. Not unfrequently, however, the proportion of the thallus is comparatively great, and in circumstances unfavourable to the development of the organs of fructification, it extends itself greatly in the matrix, as in the case of Dry Rot, Ergot, &c. (q. v.), and even of the common mushroom. The thallus of fungi is called *mycelium* (Gr., *mykes*, a mushroom), and in mushrooms and some other kinds is further popularly known as the *spawn*. Fungi are nearly related to algæ and to lichens, but differ from both in deriving their nourishment from the earth or from the bodies upon which they grow, not from the medium by which they are surrounded. They differ also from lichens in their generally much softer substance and their fugacious character; also in being quite destitute of green granules (*gonidia*) in the thallus, which are characteristic of that order. They differ from algæ in not living immersed in water or other liquid, but producing their fructification in air. The lowest forms of fungi, and the lowest forms of algæ, are sometimes, however, not easily distinguished; and the mycelium of some fungi is capable of spreading in a liquid, and assuming a modified appearance extremely resembling that of some algæ. It is supposed to be the presence of the *mycelium* of certain fungi which makes liquors 'mothery;' and to a similar cause is ascribed the ropiness of the dough in some bakehouses, an evil not easily cured. —From other plants in general, fungi differ in their chemical composition, which is remarkably nitrogenous, and assimilates them to animal organisms; whilst unlike other plants, they do not absorb carbonic acid from the air, and give out oxygen, but, like animals, absorb oxygen, and give out carbonic acid; so that some naturalists have proposed to constitute for them a distinct kingdom of nature intermediate between the animal and the vegetable.

Fungi are very various in size, many being scarcely visible without a microscope, whilst others are some feet in diameter. Even the same species, however, often exhibits great variety, not only in size, but in other particulars, according to the different circumstances of its growth, causing great difficulty to the botanist, whilst further difficulty arises from the modifications of imperfectly developed mycelium, of which many spurious genera have been constituted. A great resemblance in general appearance to fungi is sometimes exhibited by diseased portions of leaves, &c., and by the secretions caused by the attacks of insects.—When the spore (seed) of a fungus germinates, it sends out radiating filaments, which generally branch and interlace, and portions of this mycelium removed to another favourable situation, grow there, so that fungi are propagated by this means as higher plants are propagated by their tubers or by the division of their roots. The fungi of simplest structure or lowest organisation consist of nothing more, when they have reached their fullest development, than masses of spheroidal cells, spores, breaking up into a fine powder, as in some of the small parasitic species which are very injurious to corn. Sometimes these cells are united into jointed threads. In species of rather higher organisation, the plant consists of jointed threads, but the spores are formed in the enlarged terminal joints, and are dispersed by their bursting. In the higher kinds, the spores are produced in or on peculiar organs of extremely various shape and character. In some, as puff-balls, the whole interior of the plant is filled with the fructification. In agarics, boleti, morels, &c., the fructification takes place on a particular membrane, a part of the external surface of the plant, called the *hymenium*, variously situated (in agarics on the under side of the *pileus* or cap), the extent of which is often greatly increased by wrinkles, plates or *gills*, pits, pores, &c. These form the highest division of fungi, called *Hymenomycetes*, in the system of Fries, the greatest continental authority in mycology, as this department of botany is sometimes termed. Berkeley, who, without any near rival, occupies the first place among the mycologists of Britain, divides fungi into two 'classes;' the first class not having the spores enclosed in tubular sacs (*asci*) or vesicles, and containing the 'orders' *Hymenomycetes* (agarics, boleti, &c.), *Gasteromycetes* (puff-balls, &c.), *Coniomycetes* (rust, smut, &c.), *Hyphomycetes* (mould, mildew, *botrytis*, *oidium*, &c.); the second class containing two orders, *Ascomycetes* (morels, truffles, &c.), in which the spores are definitely arranged in *asci*, and *Physomycetes* (some kinds of mould, plants which grow on fermenting substances, and some of the minute pests of cultivated plants) in which the spores are in vesicles without definite arrangement.

Fungi generally grow in damp situations, but there are many which occur chiefly on dry soils or on dry substances; and some appear in their greatest perfection in the finest summer weather, although many are most abundant in the colder and moister seasons of the year. It has been commonly asserted that they abound more in the colder parts of the world than within the tropics, but it is not improbable that this opinion has its origin merely in imperfect observation of tropical species. The extreme rapidity of their growth, the briefness of their whole existence, the readiness with which they pass into decomposition, and the difficulty of preserving most of them in a form fit for examination, have been great obstacles to their scientific study. It is known, however, that some species are of very wide geographic distribution, whilst others are comparatively very limited. Some species grow in earth, others in various kinds of putrescent or fermenting animal or vegetable matter, many in decaying parts of trees or on dead wood, others on diseased animal and vegetable tissues, &c. It appears to be the office of many of them to hasten the decomposition of animal, and more particularly of vegetable substances. Some of the minute kinds appear to be the cause of disease in the higher kinds of plants which they attack, and are formidable to the farmer and the gardener. Some are in like manner destructive to animal life, as in the case of the Muscardine (q. v.) or Silk-worm Rot, and certain species of *Sphæria* which grow from living caterpillars. See ENTOPHYTES.

Some fungi are remarkably phosphorescent. Thus the undeveloped mycelium of some kind produces a very beautiful luminosity in some German coal-mines; and a species of agaric (*Agaricus Gardneri*), growing on palms in Brazil, shines brightly in the night. *Agaricus olearius*, a native of the south of Europe, is also luminous.

The chemical examination of fungi yields in large quantity a substance called *Fungine*, which, however, is now regarded as consisting of cellulose and fatty matter, several other nitrogenous substances, an acid called *Fungic Acid*, a kind of sugar, &c. The poisonous properties of some are ascribed to an alkaloid called *Amanitine*. Others appear to owe their poisonous character to an acrid volatile substance. Many of the smaller fungi are important because of the injury which they cause to crops, timber, &c. A few species are used in medicine, of which the only one really important is Ergot of Rye. One or two are used as tinder (see AMADOU), Moxa (q. v.), &c. The smoke produced by burning the dust (spores) of ripened puff-balls has anæsthetic properties, and is used for stupifying bees. *Polyporus squamosus* cut into slices makes the best of razor-strops. But the chief economical use of fungi is for food, and in the manufacture of the sauce called Ketchup (q. v.).

Edible Fungi.—Many fungi of the sub-orders *Hymenomycetes*, *Gasteromycetes*, and *Ascomycetes* are edible; and some of them are much esteemed as delicacies, whilst in many countries they constitute an important part of the food of the people. In Britain, very few are used, many of those species which are most esteemed on the continent of Europe being utterly disregarded, and indeed classed in popular estimation with toad-stools as poisonous. The truth appears to be, not that the greater number are poisonous, and only a few edible, but that the noxious species are comparatively few, the principal danger arising from the similarity of some of the poisonous and some of the edible agarics, and from the liability of some of the edible species to acquire poisonous properties in particular situations and circumstances. This is notably the case with the common mushroom (*Agaricus campestris*), which is far more generally used in Britain than any other edible fungus, but of which some varieties are unsafe, apparently in consequence of the circumstances of their growth. From the markets of Rome, and other cities of Italy, where numerous species of fungi are extensively sold, this species is rigorously excluded. So important an article of food are fungi in Italy, that in the market of Rome alone they are supposed to be sold to the value of about £4000 a year. For weeks, both in spring and in autumn, fungi form the principal and almost the sole food of multitudes of the poor in Italy, Germany, and France; and besides those which are eaten fresh, great quantities are used dried or preserved in oil, vinegar, or brine. The soaking of fungi in vinegar or brine takes away the acrid qualities of some which are dangerous when fresh, and renders them perfectly safe. So valuable are fungi esteemed, that some species are frequently cultivated. The cultivation of the Common Mushroom (q. v.) is familiar to us in Britain, but other species of *Agaricus*, *Boletus*, &c., are plentifully raised in some parts of the continent of Europe, by watering the ground in places appropriate for them with water in which mature plants abounding in spores have been bruised; others are obtained by merely placing in favourable circumstances substances in which their spores are already contained. Thus, a species of *Polyporus*, much esteemed, is procured in Italy by moistening a porous stone (Ital., *Pietra funghaia*) over which a little earth has been scattered; another species of *Polyporus* by slightly charring and then watering blocks of the wood of the common hazel; a species of *Agaricus*, by cutting off and then watering the heads of black poplar trees; and another *Agaricus*, by placing the grounds of coffee in circumstances favourable for its growth.

It is a common notion, but utterly destitute of foundation, that dangerous fungi may be distinguished from those which it is safe to eat by their discolouring a silver spoon if they are stirred with it whilst they are being cooked. Nor is greater dependence to be placed on the rule that the more readily deliquescent fungi are poisonous; nor on peculiarities of colour of the flesh or juice, except in so far as these characters may avail for the discrimination of particular species, the qualities of which are known. The edible fungi have generally an agreeable smell and taste, whilst some of the poisonous kinds are offensive both to the nostrils and the palate, but no trustworthy general rule can be laid down on these points; and some of those which are very pungent and acrid when raw, become bland and wholesome when cooked, their acridity being dissipated by heat.

Among the most important edible fungi are:

Hymenomycetes.—The Common Mushroom, Champignon, and numerous other agarics and fungi closely allied to true agarics, as species of *Cortinaria*, *Cantharellus*, &c. These will be noticed in the article MUSHROOM.

A number of species of *Boletus* (q. v.), and of *Polyporus*. See AMADOU. *Fistulina hepatica.* See FISTULINA. Several species of Hydnum (q. v.). Several species of *Clavaria*, some of which are found in Britain; beautiful fungi, with a thickish stem which divides into numerous small branches. It is said that all the species of this genus are esculent, although some are very superior to the rest in flavour and delicacy. One species (*C. flava*) is popularly known in Germany as *Ziegenbart* or Goat's-beard. They grow on the ground in woods and pastures.

Clavaria Botrytis.

Gasteromycetes. — Different kinds of Puff-ball (q. v.), in a young state, and whilst still fleshy throughout.

Ascomycetes.—Different species of Morel (q. v.), *Helvella* (q. v.), *Verpa*, *Peziza*, &c. The Common Truffle (q. v.), and allied species. *Cyttaria Darwinii*, which grows on living branches of South American beeches, and forms a principal part of the food of the natives of Tierra del Fuego during some months of the year.

'It is a curious fact that the poisonous properties of mushrooms vary with climate, and probably with the season of the year at which they are gathered. Another circumstance deserving of notice is, that by idiosyncracy some individuals are liable to be seriously affected even by those species which are usually regarded as innocent. Some species which are poisonous in this country, are used freely by the Russians; it appears they are in the habit of salting, boiling, and compressing them before they are eaten; and this may in some instances suffice to account for their having no noxious effects.

'*Symptoms and Effects.*—The noxious species of mushrooms act sometimes as narcotics, at others as irritants. It would appear from the reports of several cases, that when the narcotic symptoms are excited, they come on soon after the meal at which the mushrooms have been eaten, and that they are chiefly manifested by giddiness, dimness of sight, and debility. The person appears as if intoxicated, and there are singular illusions of sense. Spasms and convulsions have been occasionally witnessed among the symptoms when the case has proved fatal. In some instances, the symptoms of poisoning have not commenced until thirty hours after the meal; and in these, narcotism followed the symptoms of irritation. It might be supposed that these variable effects were due to different properties in the mushrooms, but the same fungi have acted on members of the same family, in one case like irritants, and in another like narcotics. In most cases, recovery takes place, especially if vomiting be early induced. In the few instances which have proved fatal, there has been greater or less inflammation in the stomach and bowels, with congestion of the vessels of the brain.

'*Treatment.*—The free use of emetics and castor oil.'—Taylor *On Poisons.*

The esculent fungi of England are the subject of a work by Dr Badham, who enthusiastically recommends them to more general use.

FU'NGIBLES. In the law of Rome, the contract of loan was divided into *mutuum* and *commodatum*, a division which has been adopted by the law of Scotland, and by most of the continental systems which are founded on the civil law. The former had reference to objects which admitted of being estimated by weight, measure, or number, or which could not be used without being given away or consumed. These objects, consisting of money, corn, wine, oil, and the like, could be used only by him who possessed the full right of ownership, and consequently the contract of *mutuum* transferred the ownership to the borrower, who became bound to return, not the object borrowed, but its equivalent. Objects of this nature, from the fact that they were got rid of one for another (*fungantur*), were called fungibles. The other class of movable objects, again, to which the Roman contract of *commodatum*, or hire, properly so called, applied, were transferred to the borrower on condition that he should return the same individual objects to the lender.

FUNGUS (Lat. a mushroom) is a term applied in pathology and surgery with several significations. Thus, any excrescence from a surface of skin, or mucous membrane, or even from deeper parts, is sometimes called a fungus, more especially if it have a soft mushroom-like character, and a broad short pedicle. When the pedicle is long and narrow, it is called Polypus (q. v.). The growths to which the term fungus is chiefly applied are those which have the characters of Cancer (q. v.); especially *fungus hæmatōdes*, a very dangerous variety. But fungus has yet another application in pathology, to those minute incrustations and alterations of the skin which are dependent upon the growth of vegetable parasites, as Favus, Ringworm (q. v.), &c.

FUNNEL (Lat. *fundo*, to pour), in steam-vessels, is the iron tube designed to convey away above the deck the smoke and gases set at liberty during the combustion of fuel in the boiler-flues, and also, from its height, to afford a sufficient draught to the furnaces. In large ships, the funnel is of great size; and in men-of-war, usually telescopic, so that, by simple mechanism, it may be withdrawn during an action from the chance of injury by cannon-shot.

FUNNEL, a conical vessel terminating in a tube, and used for pouring liquids into narrow-mouthed vessels, and in laboratories for filtering. See FILTER. For common purposes, they are made of tin-plate or copper, but when for corrosive liquids, they are made of glass or earthenware. In some parts of Great Britain, as in the midland counties of England, a funnel is called a 'tun-dish;' in other parts, a 'filler.'

FUR is the term applied to the incrustation which is formed in the interior of vessels (tea-kettles, boilers of steam-engines, &c.) when calcareous water has been for a considerable time boiled in them. Many spring waters contain carbonate of lime held in solution by carbonic acid. When this water is boiled, the acid is expelled, and the carbonate is deposited, often in association with a little sulphate, forming a lining more or less coherent upon the sides of the vessel. In steam-boilers, this may be prevented by the addition of a small quantity of sal-ammoniac (hydrochlorate of ammonia) to the water; double decomposition takes place, carbonate of ammonia being formed and volatilised, while chloride of calcium remains in solution.

FUR AND FURRIERY. The skins of animals, having hair or fur as a coating, have been used in Europe as an article of clothing for many centuries. Since European countries, however, have become more and more cleared and inhabited, fur-bearing animals have nearly disappeared; and the supply is now chiefly obtained from other regions, especially North America.

All the chief fur-bearing animals will be found described under their proper headings: we shall do little more here than barely enumerate them. *Ermine* fur is of a pure white, except the tip of the tail, which is black. The spotted appearance of this fur is not natural; it is produced by sewing the black tail-tips on the white fur at certain spots. *Stoat* fur is a kind of inferior ermine. *Sable* fur, obtained chiefly from Northern Russia and Siberia, is valued in proportion to the darkness of its colour. *Marten* fur, especially that of a rich dark-brown olive colour, is much sought for. *Fiery-fox* fur, brought chiefly from the north-eastern part of Asia, is admired both for its brilliant fiery colour and for its fineness. *Red-fox* fur, differing in some particulars from the kind just named, is much sought after by the Chinese for trimmings, linings, and robes. *Silver-fox* fur has a peculiar lustrous silver-gray colour. *Nutria* fur, belonging to the animal called the *coypou*, is brought largely from South America, chiefly as a cheap substitute for beaver. *Sea-otter* fur has been known in Europe about a century and a half, being obtained from the otters which frequent the seas washing the Asiatic shores of the Russian dominions; it varies from a beautiful brown to jet-black, and is very fine, soft, and glossy. *Seal* fur is obtained from the seals frequenting various coasts, chiefly in the Southern Ocean. *Beaver* fur was once much in request for the manufacture of hats; but the growing scarcity of the animal, and the substitution of silk hats for beaver hats, has lessened its importance. The fur of various other animals is similarly valued, either for its warmth or its beauty; such as that of the *bear*, *racoon*, *badger*, *minx*, *lynx*, *musquash* or *musk-rat*, *rabbit*, *hare*, *squirrel*, and *chinchilla*.

For manufacturing purposes, furs are classified into *felted* and *dressed*. Felted furs, such as beaver, nutria, hare, and rabbit, are used for hats and other felted fabrics, in which the hairs or filaments are made so to interlace or entangle as to form a very strong and close plexus. The quality of the fur is better when the skin is taken from the animal in winter than in any other season, giving rise to the distinction between 'seasoned' and 'unseasoned' skins. The removal of the fur from the pelt is a necessary preliminary to the preparation of fur for felting purposes. In many kinds of skin, such as that of the hare, the fur is of two kinds—a close short layer of felting fur next the pelt, and longer outer hairs of unfelting fur. The removal of these two is effected separately. The long hairs are cut off by a kind of shears; and the true fur is then removed by the action of a knife, bearing some resemblance to a cheese-cutter, requiring much care in its management. In some sorts of skin, the long hairs are removed by pulling instead of shearing; in others, the greasiness of the pelt renders necessary a cleansing process before the shearing can be conducted, with the aid of soap and boiling water; and in others, both pelt and fur are so full of grease as to require many repetitions of cleansing. For beaver skins, a machine of very beautiful construction is employed in cutting the fur from the pelt. When the coarse hairs have been removed to form a stuffing for cushions, the skin is placed in a machine containing a broad keen blade equal in length to the width of the skin. This blade has a peculiar reciprocating movement given to it, producing a kind of chopping effect on any substance to which it is applied, by coming nearly in contact with another blade placed parallel with it. The skin is guided between rollers into the space between the two blades; and then the action of the upper blade crops off the fur from the pelt in a very complete manner—every particle being removed, and yet the pelt is not cut. The fur falls upon an endless apron, which carries it to a chest, or trunk, containing a blowing-machine; this machine separates the fur into three or four qualities, by blowing to the furthest distance the lightest and most valuable filaments, leaving the heavier and coarser to be deposited sooner.

Furs have their felting property sometimes increased by the process of *carroting*, in which the action of heat is combined with that of sulphuric acid. The chief employment of felted furs is described under HAT MANUFACTURE.

Dressed furs are those to which the art of the *furrier* is applied for making muffs, boas, and fur-trimmings to garments. The fur is not separated from the pelt for these purposes; the two are used together; and the pelt is converted into a kind of leather to fit it for being so employed. The fur-hunters always exercise great care in drying the skins after removing them from the animals, seeing that any putrefactive action would ruin the fur. When brought to England, the skins undergo certain cleansing processes. They are steeped and scoured in a bath of bran, alum, and salt, to remove greasiness from the pelt; and then in a bath of soap and soda, to remove oiliness from the fur. When thoroughly washed and dried, it is found that the pelt, by the action of the alum, has been converted into a kind of *tawed* or kid leather.

When the skins are cleansed and dried, they are made up into garments and trimmings by sewing through the pelt. The skins, however, are very irregular in shape, and often differ much in colour in different parts; they require to be cut up into pieces, matched according to tint, and sewn together edge to edge. This requires much skill, especially where the furs are of a valuable sort. A fur garment or trimming, appearing to the eye as if it were one uniform piece, is thus generally made up of many curiously shaped pieces. The shaping for use, and the lining with silk and other materials, call for no description.—The great source of furs is the Hudson's Bay Territory (q. v.).

FURFU'RAMIDE, FU'RFURINE, AND **FU'RFUROL.** When starch, sugar, or bran is acted upon by dilute sulphuric acid and peroxide of manganese, the distillate contains not only Formic Acid (q. v.), but a small quantity of an essential oil, which, after being purified by redistillation, is colourless, has a fragrant odour somewhat resembling that of bitter almonds, and when dissolved in cold sulphuric acid, forms a beautiful purple liquid. This oil is termed Furfurol, and its composition is represented by the formula $C_{10}H_4O_4$.

If furfurol be treated with ammonia, it is converted into Furfuramide ($C_{30}H_{12}N_2O_6$), which occurs in colourless crystals, insoluble in water, but soluble in alcohol, and perfectly neutral.

If furfuramide is boiled with a solution of potash, it dissolves, its elements assume a new arrangement, and the solution on cooling deposits long silky needles of a powerfully alkaline base, Furfurine, which is isomeric with furfuramide. It is dissolved by dilute acids, and completely neutralises them; and on adding ammonia to these solutions, the alkaloid is precipitated unchanged. It was discovered by the late Professor Fownes; and as the first vegeto-alkali artificially formed, its production was regarded as a great step in organic chemistry.

FURIDPU'R, a town of Bengal Proper, capital of a district of the same name, stands on the right bank of the Ganges, here called the Podda, in lat. 23° 36′ N., and long. 89° 50′ E. It is 115 miles to the north-east of Calcutta. Excepting the public establishments, which it possesses as the capital of the district of its own name, the place is mainly a scattered series of native villages; and, in fact, it claims notice chiefly as having at one time been a nest of river-pirates.

FURIDPU'R, or **DACCA JELALPUR,** the district mentioned in the preceding article, stretches in N. lat. between 23° 3′ and 24° 5′, and in E. long. between 89° 30′ and 90° 15′, containing 2052 square miles, and 855,000 inhabitants. It is everywhere intersected by branches or feeders of the Ganges, which, as the surface barely rises above the level of the sea, are all, unless in the dry season, well adapted to navigation. The soil is in general rich; and the climate, more particularly from the beginning of March to the middle of June, is excessively hot.

FURIES. See EUMENIDES.

FURLONG (the length of a furrow), a measure of length, the eighth part of a mile or 220 yards. See YARD.

FU'RLOUGH, a military term signifying leave of absence. Non-commissioned officers and private soldiers on furlough must be provided with a pass, or they are liable to be seized and dealt with as deserters.

FURNEAUX, the name of an English navigator, who was second in command on Cook's second voyage, indicates various localities in the southern hemisphere.—1. Furneaux Strait separates the Middle and South islands of the New Zealand chain.—2. Furneaux Island, in the open Pacific, lies in lat. 17° S., and in long. 143° 6′ W.—3. Furneaux Islands are a group in Bass's Strait (q. v.). They are numerous, the largest measuring 35 miles by 10. The soil is sandy, and the vegetation scanty. The centre of the cluster is about lat. 40° S., and long. 148° E.

FURNES, a small town of Belgium, in the province of West Flanders, is situated in a marshy and unhealthy district, 4 miles from the sea, and 27 miles west-south-west of Bruges. At this town, four important lines of canal meet. F. is well built, has a town-house, a fine Gothic structure, richly ornamented with carvings, and has interesting remains of the former Abbey of St Willebrod. It has a great trade in horses, cattle, hops, and cheese; and has three annual fairs, at which large quantities of linen are sold. Pop. 5000.

FU'RNITURE, the name of an organ-stop or register, consisting of two or more ranks of pipes to each note, all of a higher pitch than the 15th stop.

FURNITURE, HOUSEHOLD, HIRING OF. If a man lets out furniture for immediate use, there is an implied warranty that it is fit for use, and free from all defects inconsistent with the reasonable and beneficial enjoyment of it. Sutton *v.* Temple, 12; Meason and Welsby, 60. The hirer must use the furniture for a proper purpose. If it is applied to a purpose inconsistent with the terms of the contract, or if it is sold by the hirer, the owner is entitled to maintain an action for its value. These general rules may be regarded as prevailing both in England and Scotland. In case of wilful injury done to furniture by a tenant within the metropolitan police district, it is provided by 2 and 3 Vict. c. 71, s. 38, that the police magistrate may award compensation to the amount of £15. In England as well as Scotland, the use of furniture for life is often made the subject of a bequest; and in this case, allowance will be made for ordinary wear and tear in the use of the furniture.

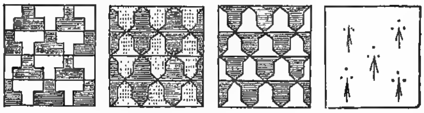
Lien on Furniture for Rent.—As a general rule, all furniture found on the premises, whether the property of the tenant or of a third party, may be distrained for rent, on the principle that the landlord has a lien over it in respect of the place in which it is found, and not in respect of the person to whom it belongs. To this rule there are some exceptions in favour of trade, as of tools in actual use, &c. In Scotland, the landlord has a similar right over the furniture in a house, so that hired furniture may be seized; but furniture lent without payment of rent does not fall under this Hypothec (q. v.). Even where furniture has been sold, the landlord has a claim over it while it remains on the premises.

FURRÛCKABA'D (Happy Residence), a city of the Doab (q. v.), stands near the right bank of the Ganges, in lat. 27° 24′ N., and long. 79° 40′ E. It is a handsome, cleanly, and healthy place, 570 feet above the level of the sea, with a considerable trade, and a population of about 60,000. Independently of its position on the grand artery of the country, F. is within 20 miles of the great route between Calcutta and Delhi. Here Lord Lake defeated the troops of Holkar in 1805.

FURRUCKABAD, the district of which the city of the same name is the capital, stretches in N. lat. between 26° 46′ and 27° 43′, and in E. long. between 78° 57′ and 80° 2′. With a population of 854,799, it contains only 1909 square miles, scarcely one-twelfth of the area being beyond the limits of the Doab. The commercial crops are principally cotton, tobacco, and indigo.

FURS, in Heraldry. Shields being often covered with the skins of wild animals, on which the fur was left, there came to be certain kinds of fur which were used in coat-armour, as well as in trimming and lining the robes of knights and nobles, and the mantles which were represented as surrounding their shields. The principal heraldic furs are—1. Ermine of which the field is white, and the spots black; 2. Ermines of which the field is black, and the spots white; 3. Erminois which has the field gold, with black spots; 4. Vair, which consisted of pieces of the shape of little glass pots (Fr. *verres*, of which the word is a corrupt spelling). It is said that the furriers used such glasses to whiten furs in, and because they were commonly of an azure (blue) colour, the fur in question came to be blazoned *argent* and *azure;* whilst counter-vair, in which the cups are represented as placed base against base, in place of edge to base, as in vair, was *or* and *azure.*

FURS.



Potent. Counter-vair. Vair. Ermine.

5. Potent and counter-potent, which are supposed to resemble the heads of crutches, placed differently, but having the same tinctures—viz., azure and argent.

FÜRST, JULIUS, a distinguished orientalist of Jewish parentage, was born 12th May 1805, at Zerkowa, in the grand-duchy of Posen, Prussia, where his father was Lecturer on Circumcision in the synagogue. F. was educated for the rabbinical profession, and displayed at a very early age a most remarkable power of acquiring knowledge. He studied at Berlin, where the German philosophy made sad havoc of his previous convictions. The conflict in his mind between science and rabbinical lore ended, in 1829, in the defeat of the latter, and F. immediately proceeded to Breslau, where he continued his oriental, theological, and antiquarian studies, which were completed at Halle in 1831, under Gesenius, Wegscheider, and Tholuck. In 1833 he went as a teacher of languages to Leipsic, where he still lives. Among his numerous and valuable writings may be mentioned *Lehrgebäude der Aramäischen Idiome* (System of Aramaic Idioms, Leip. 1835), a work which brought the Semitic languages within the sphere of comparative grammar, then in its infancy, and which, besides, sought to establish a system of analytico-historic investigation in regard to these languages themselves; *Perlenschnüre Aramäischer Gnomen und Lieder* (Pearl-strings of Aramaic Gnomes and Songs, Leip. 1836), with elucidations and glossary; *Concordantiæ Librorum Sacrorum Veteris Testamenti Hebraice et Chaldaice* (Concordances of the Sacred Books of the Old Testament in Hebrew and Chaldee, Leip. 1837—1840), a work of indefatigable industry and careful research, which has obtained for its author a great reputation both in Germany and other countries; *Ari Nohem* (Leip. 1840), a polemical treatise on the genuineness of the Sohar and the worth of the Cabbala; *Die Sprüche der Väter* (The Sayings of the Fathers, Leip. 1839); *Die Israelitische Bibel* (The Hebrew Bible, Berlin, 1838), translated into

German from the original, by himself, in conjunction with other scholars; *Der Orient; Berichte, Studien und Kritiken für Jüdische Geschichte und Literatur* (The East; Notices, Studies, and Criticisms in connection with Jewish History and Literature, Leip. 1840); *Die Jüdischen Religionsphilosophen des Mittelalters* (The Jewish Religious Philosophers of the Middle Ages, Leip. 1845); *Geschichte der Juden in Asien* (History of the Jews in Asia, Leip. 1849); *Bibliotheca Judaica* (1849—1853); and *Hebräisches und Chaldäisches Handwörterbuch* (Hebrew and Chaldee Manual, Leip. 1851—1854), preceded by a history of Hebrew lexicography.

FÜ'RSTENWALDE, a small walled town of Prussia, in the province of Brandenburg, on the right bank of the Spree, 30 miles east-south-east of Berlin. It has a brick church of the 14th c., the *Marienkirch*, which contains a fine Gothic *Sacramentshäuschen* (or pyx for keeping the host), built of sandstone, and dating from 1510. F. manufactures linens and woollens, and carries on some trade by river. Pop. 5890.

FÜRTH, a flourishing manufacturing town of Bavaria, in Middle Franconia, is situated at the confluence of the Rednitz and the Pegnitz, about 5 miles north-west of Nürnberg, with which it is connected by a railway, laid out in 1835, and the first that was completed in Germany. It has numerous churches, synagogues, a town-hall, theatre, &c. It is the most industrious and most prosperous manufacturing town of Bavaria; its mirrors, chandeliers, snuff-boxes, lead-pencils, its brass and wood wares, and its articles of dress, are famous. The making of metallic leaf, and the manufacture of articles in bronze, are most important branches of industry. F. also produces pinchbeck rings, watch-keys, brass nails, spectacles and optical instruments, in great abundance. An annual fair, lasting fourteen days, takes place at Michaelmas. Pop. 17,341, of whom 2500 are Jews, and the rest Protestants. F. first appears in history about the beginning of the 10th c., when it belonged to the archbishops of Bamberg. Subsequently it acknowledged the authority of the Burgrafs of Nuremberg. In 1634, during the Thirty Years' War, the Austrian Croats burned it to the ground. In 1680 a great fire almost laid it in ashes again. It first began to attain importance as a seat of manufactures in the latter half of the last century.

FURY AND HECLA STRAIT, lying in lat. 70° N., and long. from 82° to 86° W., separates Melville Peninsula on the south from Cockburn Island on the north, and connects Fox's Channel on the east with the Gulf of Boothia on the west. It is of no value whatever as a means of communication, nor is ever likely to be so, its western entrance having been ascertained by Captain Parry, who discovered it, on his second voyage, to be impenetrably closed from shore to shore by the accumulated ices of many years. It is traversed from west to east by a strong current, which passes down Fox's Channel into Hudson's Strait.

FURZE (*Ulex*), a genus of plants of the natural order *Leguminosæ*, sub-order *Papilionaceæ*, distinguished by a two-leaved calyx with a small scale or bractea on each side at the base, stamens all united by their filaments, and a turgid pod scarcely longer than the calyx. The COMMON F. (*U. Europæus*), also called WHIN and GORSE, is a shrub about two or three feet high, extremely branched; the branches green, striated, and terminating in spines; the leaves few and lanceolate; the flowers numerous, solitary, and yellow. It is common in many of the southern parts of Europe and in Britain, although it does not reach any considerable elevation on the British mountains, and often suffers from the frost of severe winters; whereas in mild seasons its flowers may be seen all winter, so that there is an old proverb, 'Love is out of season when the furze is out of blossom.' It is scarcely known in any of the northern parts of Europe; and Linnæus is said to have burst into exclamations of grateful rapture when he first saw a common covered with F. bushes glowing in the profusion of their rich golden flowers. F. is sometimes planted for hedges, but is not well suited for the purpose, occupying a great breadth of ground, and not readily acquiring sufficient strength; besides, it does not, when cut, tend to acquire a denser habit. It is useful as affording winter food for sheep, and on this account is burned down to the ground by sheep-farmers when its stems become too high and woody, so that a supply of green succulent shoots may be secured. In some parts of Wales, F., chopped and bruised, forms the principal part of the winter fodder of horses. In some places, it is sown to yield green food for sheep or other animals, but is preferable to other green crops only on dry sandy soils, where they could not be advantageously cultivated. It is most extensively cultivated in Flanders. It is chopped and bruised by means of a mallet, one end of which is armed with knife-blades; or by means of a simple machine, called a gorse-mill.—A double-flowering variety is common in gardens. A very beautiful variety, called IRISH F., because originally found in Ireland (*U. strictus* of some botanists), is remarkable for its dense, compact, and erect branches. A dwarf kind of F. (*U. nanus*) occurs in some places, and is perhaps also a mere variety; if so, there is only one species known.

In fox-hunting countries, F. is encouraged on account of the excellent *cover* it affords. It is also a favourite cover for rabbits.

FUSE, FUSEE, a tube of wood or metal, perforated down the side with a vertical row of holes, and used for firing shells. The tube is filled with a composition of nitre, sulphur, and gunpowder, which will burn gradually. The distance between each hole representing a second, the range and time of flight are computed, and that hole is left open which will communicate the fire in the fuse to the loaded shell at the moment the latter touches the ground after being discharged. Of course, when combustion reaches this aperture, the shell is burst by the explosion of the contained gunpowder, and scattered around in numerous fragments. Fuses constructed on a similar principle are used in exploding military mines (q. v.).

FUSEL or **FOUSEL OIL**, known also as POTATO SPIRIT, is a frequent impurity in spirits distilled from fermented potatoes, barley, rye, &c., to which it communicates a peculiar and offensive odour and taste, and an unwholesome property. Being less volatile than either alcohol or water, it accumulates in the last portions of the distilled liquor. According to Liebig, it is principally formed in the fermentation of alkaline or neutral liquids, while it never occurs in acidulous fermenting fluids which contain tartaric, racemic, or citric acid. It mainly consists of a substance to which chemists have given the name of amylic alcohol, whose composition is represented by the formula $HO,C_{10}H_{11}O$. It is a colourless limpid fluid, which has a persistent and oppressive odour and a burning taste. It is only sparingly soluble in water, but may be mixed with alcohol, ether, and the essential oils in all proportions. Any spirit which produces a milky appearance, when mixed with four or five times its volume of water, may be suspected to contain it.

Fusel oil is principally sold in this country for the purpose of yielding pear essence for the so-called jargonelle-drops; it has likewise been patented as a solvent for quinine; and according to Liebig, it is sometimes employed in lighting distillery buildings.

FUSE'LI, Henry, the second son of John Caspar Fuseli, or Fuessli, a portrait-painter, and author of *Lives of the Swiss Painters*, was born at Zurich in 1742. He studied in his native town and at Berlin, travelled with Lavater in 1761, and then went to England, where, by Reynolds's advice, he devoted himself to art. In pursuance of this object, he proceeded to Italy in 1770, where he remained for eight years, studying in particular the works of Michael Angelo, and in 1778 returned to England. In 1790 he was elected a member of the Royal Academy, where, nine years later, he became professor of painting. He died at Putney Hill, near London, 16th April 1825, and was buried beside his friend, Sir Joshua Reynolds, in St Paul's. His most remarkable works are 'The Ghost of Dion,' from Plutarch; 'Lady Macbeth;' 'Hercules and the Horses of Diomedes;' and his 'Milton's Gallery,' comprising 47 designs from *Paradise Lost*. F.'s imagination was bold, but coarse; he had more genius than art; and his execution was often spasmodic in the extreme. His art-criticism, however, strange to say, ranks among the best in the language. His literary works, with a narrative of his life, were published by Knowles (3 vols., London, 1831).

FUSIBI'LITY. With few exceptions, all solids which can bear a high temperature without undergoing chemical change, may be melted. Many substances which are popularly regarded as infusible—as, for example, platinum and flint—readily fuse before the oxyhydrogen blow-pipe, or between the poles of a powerful galvanic battery; even carbon has been partially fused by the last-named means. There are many substances which cannot be melted because they are decomposed by the action of heat. Thus, wood and many other organic compounds are decomposed into certain gases, which escape, and into carbon and fixed salts, which are left. Similarly, carbonate of lime (chalk) is decomposed into carbonic acid gas and lime at a temperature below its fusing-point. If, however, we prevent the gas from escaping by confining the carbonate of lime in a hermetically closed gun-barrel, it can be melted at a high furnace-heat.

A table of 'The Order of Fusibility of the Metals' is given by Miller in his *Elements of Chemistry*, 2d edition, vol. ii. p. 294.

FUSIBLE METAL. Fusible metal is composed of 2 parts of bismuth, 1 of lead, and 1 of tin. It fuses at 201° F., becoming pasty before it completely melts. It expands in a very anomalous manner; its bulk increases regularly from 32° to 95°; it then contracts gradually to 131°; it then expands rapidly till it reaches 176°, and from that point till it melts, its expansion is uniform. The faculty of expanding as it cools, while still in a comparatively soft state, renders the alloy very serviceable to the die-sinker, who employs it to test the accuracy of his die, every line being faithfully reproduced in the cast made of the alloy. The proportions of the three metals are sometimes varied, and another formula is given in the table in Fusing and Freezing Points.

FUSIL (Fr. *fusee*, a spindle) is represented heraldically as longer and more acute than a Lozenge (q. v.).

FUSILIE'RS were formerly soldiers armed with a lighter fusil or musket than the rest of the army; but at present all regiments of foot carry the Enfield rifle. Fusilier is therefore simply a historical title borne by a few regiments—viz., the Scots Fusilier Guards, the 5th Northumberland, 7th Royal, 21st North British, 23d Welsh, 87th Irish, 101st and 104th Bengal, 102d Madras, and 103d Bombay Fusiliers.

FUSING and FREEZING POINTS are terms applied to the temperature at which solids assume the liquid form, and liquids become solid. The following table gives some of the best determinations of the fusing-point:

Mercury,	—39°	Alloy (1Sn,2Bi),	286°
Oil of vitriol,	—30°	〃 (3Sn,2Pb),	333°
Bromine,	9°·5	Tin,	451°
Oil of turpentine,	14°	Bismuth,	512°
Ice,	32°	Nitrate of soda,	591°
Lard,	91°	Lead,	620°
Phosphorus,	111°·5	Nitrate of potash,	642°
Potassium,	136°	Zinc,	773°
Yellow wax,	143°·6	Antimony, (about)	900°
Stearic acid,	158°	Silver,	1773°
Sodium,	207°·7	Copper,	1996°
Fusible metal (5Pb,3Sn, 8Bi),	212°	Gold,	2016°
Iodine,	226°·4	Cast iron,	2786°
Sulphur,	239°	Wrought iron, higher than	3280°

We see from this table that alloys may have a fusing-point far below that of any of the metals which enter into their composition. Similarly, mixtures of various silicates fuse at a temperature far below that which is required to melt any one of them, and the same remark applies to mixtures of various chlorides, carbonates, &c.

Most solids, when heated to their fusing-point, change at once into perfect liquids; but some—as, for example, platinum, iron, glass, phosphoric acid, the resins, and many others—pass through an intermediate pasty condition before they attain perfect fluidity, and, in these cases, it is difficult, if not impossible, to determine the exact fusing-point. This intermediate condition is termed *vitreous fusion*, because it is a characteristic property of glass. It is in this intermediate state that glass is worked, and iron and platinum forged.

As a general rule, the freezing-point is the same as the fusing-point—that is to say, if a substance in the liquid form be cooled below the fusing-point, it again becomes solid; but there are cases in which we can cool a liquid several degrees below its fusing-point; thus, by keeping water perfectly still, we can cool it to 5°, or even to 1°·4 before it freezes. If, however, we drop a solid body into water in this condition, or if we shake the vessel containing it, congelation begins at once, and the temperature rises to 32°. This phenomenon is exhibited to a still greater degree in viscid fluids, like the oils. It is well known that the freezing-point of water is depressed by the presence of salts. Thus, sea-water freezes at about 26°·6, and a saturated solution of common salt must be cooled as low as 4° before freezing. Despretz has given the freezing-points of various saline solutions at different degrees of concentration in the fourth volume of the *Comptes Rendus*, p. 435.

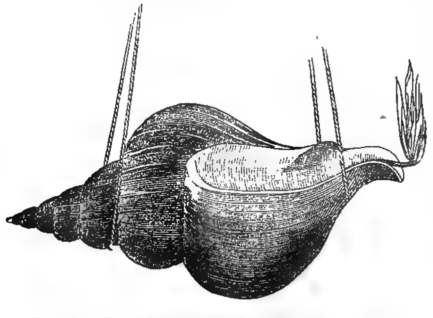
FU'STIAN, a cotton fabric having a pile like velvet, but shorter, and which is manufactured in nearly the same manner as velvet—viz., by leaving loops standing upon the face of the fabric, and then cutting them through so as to form upright threads, which are afterwards smoothed by shearing, singeing, and brushing. See Velvet.

FUSTIC, a name given to two kinds of dye-wood used for producing a yellow colour, and with chemical additions, other colours, such as brown, olive, and green. The name seems to be derived from the French *Fustet*, the name of the Venice Sumach (*Rhus cotinus*, see Sumach), a shrub found in the south of Europe; and to have been transferred to a very different plant, the *Maclura tinctoria* of Don, or *Morus tinctoria*, a tree of the natural order *Moraceæ*, a native of the West Indies, Mexico, Brazil, Columbia, &c. The fustic is a large and handsome tree, the wood is of a greenish-yellow colour, and is sometimes used in mosaic cabinet-work and turning, but chiefly in dyeing. About 10,000 tons are imported annually into Britain. The tree is particularly abundant in Campeachy. The wood contains a great quantity of colouring matter, which forms the most durable of vegetable yellow dyes; but as the colour is rather dull, it is more used for producing other colours. The name Old Fustic is sometimes given to it, and Young Fustic to the wood of *Rhus cotinus.* These terms began to be employed about the beginning of last century, from the mistaken notion that the one, in small pieces, was the wood of the young tree, and the other, in comparatively large logs, of the same tree in a more mature state.—The Osage Orange (q. v.) of North America (*Maclura aurantiaca*) is nearly allied to old fustic, and its wood also affords a yellow dye.

Old Fustic, or Yellow Wood, is employed for dyeing woollens yellow, and also to impart to them green and olive colours when mixed with indigo and salts of iron. It furnishes a yellow colouring matter, which may be obtained in crystals by evaporating its watery solution. This substance is termed moritannic acid, and its composition is represented by the formula $C_{26}H_{16}O_{20}$. The bichromates of potash and of lead have to a great degree superseded the use of Old Fustic.

Young Fustic is the wood of *Rhus cotinus* or *Venetian sumach.* It contains a yellow colouring matter, to which the name *Fusteric* has been given. It is generally used in combination with other dyes, in order to strike some particular tint.

FUSUS (Lat. a spindle), a genus of gasteropodous molluscs nearly allied to *Murex* (q. v.), having a spindle-shaped shell, with a very elevated spire, the first whorl often much dilated, and a straight elongated canal. The whorls are not crossed by varices, as in *Murex.* The species were formerly, however, included in that genus. About 100 existing species have been described, and more than three times that number of fossil ones. The existing species are distributed over the whole world, living generally on muddy and sandy sea-bottoms at no great depths.



Roaring Buckie, as used by the Zetlanders.

F. antiquus is known in the south of England as the Red Whelk, and in Scotland as the Roaring Buckie, from the continuous sound—as of waves breaking on the shore—heard when the empty shell is applied to the ear. In the cottages of Zetland, the shell, generally about six inches long, is used for a lamp, being suspended horizontally by a cord, its cavity containing the oil, and the wick passing through the canal. This mollusc is often dredged up with oysters. It is eaten by the poor, but is more generally used as bait for cod, skates, &c.

This genus makes its first appearance in the Oolite, in which 10 species have been noticed. The numbers increase to 35 in the Cretaceous rocks, to 100 in the Eocene, and to 150 in the Miocene and Pliocene.

FUTA'K, a town of Lower Hungary, in the county of the Lower Bacs, is situated on the left bank of the Danube, in lat. 45° 15′ N., and long. 19° 42′ W. It has a beautiful castle and garden, and the inhabitants grow vegetables and tobacco extensively. F. has a great trade in corn, and has a fair in November, frequented by merchants from Turkey, Greece, and Armenia. Pop. 7800.

FUTEHGU'NGE (in English, *Victory Market*) is the name of two places in Rohilcund, the scenes respectively, as the name implies, of two battles gained by the British over the Rohillas.—1. *Eastern* F., a town of the district of Bareilly, is situated near the right bank of the Bhagal, in lat. 28° 4′ N., and long. 79° 42′ E. The action, from which this spot is designated, was fought in 1774, giving to the Nawâb of Oude, then an ally of the English East India Company, a large part of Rohilcund; and it was, in fact, to commemorate that event, that Eastern F. was built by that prince.—2. *Western* F., a town also of the district of Bareilly, is situated in lat. 28° 28′ N., and long. 79° 24′ E. The conflict that distinguished this locality occurred in 1796. The only eminence in the neighbourhood, the most hotly contested point in the struggle, bears twofold testimony to the story, in the memorials of those who fell—a plain and simple monument of fourteen British officers, and a carved and minareted tomb of two Rohilla chieftains.

FUTTEHPU'R, a town of the Doab, on the great trunk-road between Calcutta and Delhi, stands in lat. 25° 57′ N., and long. 80° 54′ E., 70 miles north-west of Allahabad, and 50 miles to the south-east of Cawnpore. It is a thriving place, with about 16,000 inhabitants. Besides the buildings belonging to the civil establishment of the district of its own name, it contains a small, but very elegant mosque.

FUTTEHPUR, the district of which the town of the preceding article is the capital, lies wholly within the Doab, and occupies its entire breadth from Jumna to Ganges. It extends immediately to the west of the district of Allahabad, in lat. from 25° 25′ to 26° 13′ N., and in long. from 80° 12′ to 81° 23′ E., containing 1583 square miles, and 512,000 inhabitants. It yields large quantities of cotton, and by means of its bordering rivers, and a branch of the Ganges Canal, it possesses considerable facilities for inland navigation.

FUTTUHA, or **FUTWA**, a town of 12,000 inhabitants, in the district of Patna, and sub-presidency of Bengal, stands at the confluence of the Punpun and the Ganges, in lat. 25° 30′ N., and long. 85° 22′ E. As the Ganges is here deemed peculiarly sacred, F. is, at certain seasons of the year, the resort of vast numbers of pilgrims.

FUTTYGU'RH, the military cantonment of Furruckabad, stands about three miles to the east of that city, on the opposite or left bank of the Ganges, being in lat. 27° 22′ N., and long. 79° 41′ E. Its name became peculiarly famous, or rather infamous, in the mutiny of 1857, less, however, for the outbreak that occurred on the spot, than for the unparalleled sufferings of the hapless fugitives —men, women, and children.

FUTTYPU'R, a town in the district of Saugor and Nerbudda, and sub-presidency of the North-west Provinces, stands on the Unjon, a tributary of the Nerbudda, about 20 miles from the point of junction, being in lat. 22° 38′ N., and long. 78° 38′ E. It is a place of some importance, as being the residence of three Gond rajahs.

FUTURE DEBT is a debt wherein the obligation to pay and the time for payment is fixed and certain, but the day for performance has not arrived. Of such a debt, it was said in the civil law *dies cedit etsi nondum venerit;* and it was distinguished from a contingent debt, i. e., a debt payable on the performance of a condition which was uncertain, in which it was said *dies nec cedit nec venit.* Thus, an obligation to pay six months hence is a future debt; an obligation to pay 'if my ship returns from Spain,' is contingent. In the event of the death or bankruptcy of a person having large commercial transactions, it is often of great importance that the right of the holders of such securities should be accurately fixed. In Rome, on the death or bankruptcy of a citizen, a creditor holding a claim for a future debt was entitled to payment, deducting a percentage proportionate to the date at which his debt was payable; but a contingent creditor only received a security for payment in case his debt should become payable. This general principle has been introduced into the legal systems of modern states. In Holland and in France, the rights of creditors having claims not immediately payable are based upon the rule of the civil law. In England, a future debt, in order to found a valid claim, must be in writing, but it may be constituted by bond, bill, or note or other security. By common law, such a claim could not be enforced until the actual time for payment has arrived; and formerly, in case of bankruptcy, a creditor on a debt of this kind was not allowed to insist in his claim. At the same time, the bankrupt's discharge was held not to release him from a debt which had not been admitted to claim in the process; and hence debtors were sometimes incarcerated for years on debts which they were wholly unable to discharge. See Imprisonment for Debt. This state of things was productive of manifest injustice on both debtor and creditor; on the latter, by excluding him from insisting in his claim at a time when he might have obtained a partial payment; on the former, by punishing him for his default when he was deprived of the means of making any return. The subject was frequently discussed in parliament before a remedy was applied. At last, by 6 Geo. IV. c. 16, s. 51, it was enacted that, in cases of bankruptcy, where a debt was not immediately payable, the creditor should be entitled to prove his debt, and receive a dividend, deducting interest at 5 per cent. for the period which was to elapse before the date when the debt was payable in due course. By s. 56, debts payable on a contingency might be valued, and a dividend paid on the estimated value. Similar provisions were inserted in the 12 and 13 Vict. c. 196, ss. 172 and 177. By the last bankruptcy act, 24 and 25 Vict. c. 134, s. 153, it is enacted that a person having a claim for unliquidated damages, which are of the nature of a future debt, may have his claim assessed by a jury either in the court of equity, or before a common-law judge, or, in case of agreement between the parties, by the court without a jury.

By the common law of Scotland, the rule of the civil law, as to the rights of creditors having a future claim, has always been recognised. In the event of bankruptcy, creditors in both future and contingent debts are allowed to rank, but the latter only to the extent of receiving a security until the condition is purified. But by 19 and 20 Vict. c. 79, s. 53, which is now the ruling statute as to bankruptcy in Scotland, contingent creditors may have their debts valued, and may vote in the Sequestration (q. v.), and draw dividends proportionate to the valuation. It is also enacted, s. 14, that all creditors whose debts are not *contingent* may concur in the petition for bankruptcy. But the Scotch law affords to future debtors a further privilege, unknown to the system of the sister-country—viz., that of arrestment in security, whereby a creditor having a future claim is enabled, in case his debtor seem to be wilfully diminishing his means of discharging his debt, to attach the goods of the debtor as a security for the payment of his debt. See Arrestment.

FYNE, Loch, an arm of the sea running north and north-east from the Sound of Bute, in the south of Argyleshire, to beyond Inverary, in the north, and is bounded by the district of Cowal on the E., and by those of Argyle, Knapdale, and part of Cantire on the W. It is 43 miles long, 2 to 10 miles broad, and 40 to 70 fathoms deep. Its shores are deeply indented, and bordered by low bare hills, which rise higher and are wooded near Inverary. On the west side, it sends off a small branch leading to the Crinan Canal. Loch F. is celebrated for its herrings.

FYZABA'D, a rapidly decaying city of Oude, stands on the right bank of the Ghogra, here a navigable river, in lat. 26° 47′ N., and long. 82° 10′ E. Originally an appendage, as it were, of Ayodha or Oude, the ancient capital from which the country took its name, F. became, in 1730, itself the seat of government. But in 1775, immediately after the annexation of part of Rohilcund (see Futehgunge), it was supplanted by Lucknow, which lay about 90 miles to the west, in the direction of the newly acquired territory.

G

G THE seventh letter in the Roman alphabet, and in the modern alphabets derived from it. For the history of the character, see ALPHABET and letter C. The original and proper sound of G (corresponding to Gr. γ) is that heard in *gun*, *give*, *glad*. But the same natural process which turned the *k*-sound of *c* before *e* and *i* into that of *s* (see C), produced a similar change on G, so that before *e* and *i* it came to be pronounced by the Latins like *dzh*. The sibilation of the letter *g* before *i* followed by a vowel, had begun as early as the 4th c. A. D., as is evident from the misspelling in inscriptions; in the case of *c*, the change can be detected much earlier. From the Latin, the *dzh*-sound of *g* passed into the Romanic tongues, and also into English. As a general rule in English, in words derived from the classical and Romanic languages, *g* has the hissing sound before *e*, *i*, and *y*; it has its natural sound in all words before *a*, *o*, and *u*; and it retains it in Teutonic words even before *e* and *i*.

G, in its proper power, belongs to the order of gutturals, *k* or *c*, *g*, *ch*, *gh*; of the two 'bare' gutturals, *g* is the *flat* (or medial), and *k* the *sharp;* while *gh* and *ch* are the corresponding Aspirates (q. v.).

The following are some of the interchanges between *g* and other letters: Lat. *ager*, Gr. *agros*, Eng. *acre*, Ger. *acker;* Gr. *triakonta*, Lat. *triginta;* Gr. *gonu*, Lat. *genu*, Eng. *knee;* Lat. (g)*nosco*, Gr. *gignosco*, Eng. *know;* Lat. *genus*, Eng. *kin;* Gr. *chen*, Ger. *gans*, Eng. *goose* and *gander;* Lat. *hesternus*, Ger. *gestern*, Eng. *yester* (day); Lat. *germanus*, Span. *hermano*. The convertibility of *g* and *y* is seen in the old English participles in *y*, as *yclad*, corresponding to Sax. and Ger. *ge-;* in Ger. *gelb*, Eng. *yellow;* Ger. *tag*, Eng. *day;* Ger. *mag*, Eng. *may;* *yate* for *gate;* *yard* for *garden*, Lat. *hortus*. In Italian, *gi* is substituted for *j*, as *Giulio* for *Julius;* and in French, which has no *w*, that letter is represented by *gu*, as *guerre*, *guarder*, for Eng. *war*, *ward* or *guard*. G has been frequently dropt out, as Lat. *nosco* for *gnosco;* Eng. *enough*, compared with Ger. *genug;* *agone*, with *ge-gangen;* Lat. *magister*, Fr. *maistre* or *maître*, Eng. *master*. *May*, Lat. *Maius*, contracted from *Magius*, is from a root *mag*, or (Sans.) *mah*, to grow: so that May is just the season of growth.

G, in Music, is the fifth sound of the natural diatonic scale of C, and the eighth sound of the chromatic scale. It stands in proportion to C as 2 to 3; is a perfect fifth above C, and the second harmonic arising from C as a fundamental note. In the solmisation of Guido Aretinus, the note G was called Sol, Re, or Ut, according as the hexachord began with C, F, or G. G major as a key has one sharp at its signature, viz., F sharp. G minor has two flats at its signature, viz., B flat and E flat.

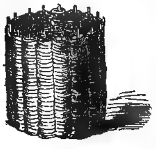
GAAL, JOZSEF, a Hungarian author, was born at Nagy Karoly in 1811, studied at the college of Buda, and at the university of Pesth, and entered soon afterwards the administrative career, being attached to the Hungarian Council of Lieutenancy. G. began writing early, and proved equally successful when gossiping in the columns of Kossuth's famous *Pesti Hirlap*, and when engaged in translating a masterpiece of Cervantes, filling the periodicals with tales and novels, or furnishing original works for the National Theatre. The sketches of country-life as it was, and as it still continues on the vast plains of Hungary, are nowhere to be found more vividly and more truly exhibited than in G.'s comedies and tales. The following are some of G.'s original compositions: *Szirmay Ilona*, a novel in 2 vols. (Pesth, 1836); *Peleskei Notarius* (The Notary of Peleske, Pesth, 1838), a comedy in four acts—might be called *the* Hungarian comedy *par excellence;* *Szvatopluk*, a tragedy in five acts. Tales: *Pusztai Kaland* (An Adventure on the Hungarian Prairies); *Tengeri Kaland az Alfoeldoen* (Seafaring Adventures in Lower Hungary); *Hortobágyi éjszaka* (A Night on the Heath of Hortobágy). During the sojourn of the Hungarian Diet at Debreczin (1849), G. was editor of a journal combating extreme radical views.

GA'BBRO, the name given by Italian geologists to a variety of greenstone composed of felspar and diallage. It is equivalent to euphotide or diallage rock.

GABELENTZ, HANS CONON VON DER, a distinguished German philologist, was born at Altenburg, 13th October 1807, and educated at the universities of Leipsic and Göttingen. In 1833, he published his *Eléments de la Grammaire Mandschoue*, a new grammar, in which the entire idiomatic character of that language was developed in concise rules. He had, moreover, a share in the establishment of a journal devoted to Oriental science (*Zeitschrift für die Kunde des Morgenlandes*), and contributed to it some interesting papers on the Mongolian language. Along with J. Löbe, he also published a critical edition of the Gothic translation of the Bible by Ulfilas, with a Latin translation, and with a Gothic glossary and grammar appended (Leipsic, 1843—1846). G. was also the first philologist in Germany who undertook a scientific treatment of the dialects of the Finnish-Tartar stem. Besides a Syrjan grammar (*Grundzüge der Syrjänischen Grammatik*, Altenburg, 1841), he furnished contributions to periodicals on the Mordvinian and Samoyed languages. He has since published some contributions to the science of language (*Beiträge zur Sprachenkunde*). The first three parts were issued in 1852, and the first volume of a collection of his Philological Fragments (*Sprachwissenschaftliche Fragmente*) appeared in 1859, and a Dissertation on the Passive Voice (*Ueber das Passivum, Eine Sprachvergleichende Abhandlung*) in 1860.

GABELLE, a French word, derived from the German *Gabe*, gift or tribute, and originally used in a general way to designate every kind of indirect tax, but more especially the tax upon salt. This impost, first established in 1286, in the reign of Philippe IV., was meant to be only temporary, but was declared perpetual by Charles V. It varied in the different provinces. Those that were most heavily taxed were called *pays de grande gabelle*, and those that were least heavily taxed, *pays de petite gabelle*. It was unpopular from the very first, and the attempt to collect it occasioned frequent disturbances. It was finally suppressed in 1789. The name *gabelous* is, however, still given by the common people in France to tax-gatherers.

GABION (Ital. *gabbia*, related to Lat. *cavea*, hollow), a hollow cylinder of basket-work, employed in field or temporary fortification, and varying in size from a diameter of 20 inches to 6 feet, with a height of from 2 feet 9 inches to 6 feet. In constructing it, stout straight stakes are placed upright in the ground in a circle of the required diameter, and are then wattled together with osiers or green twigs, as in the formation of baskets. The apparatus being raised, when completed, from the ground, the ends are fastened, and the gabion is ready to be rolled to any place where it is desirable to form a breast-work against the enemy. Placed on end, and filled with earth, a single row of gabions is proof, except at the points of junction, against musketry fire, and by increasing the number of rows, any degree of security can be obtained. The gabion has the advantage of being highly portable, from its shape, while with its aid a parapet can be formed with far less earth, and therefore in less time, than in cases when allowance has to be made for the slopes on both sides, which are necessarily present in ordinary earthen walls. The *sap-roller* consists of two concentric gabions, one 4 feet, the other 2 feet 8 inches in diameter, with the space between them wedged full of pickets of hard wood. In sapping (see Mines), these serve as substitutes for mantlets.



Gabion.

Stuffed gabions are gabions rammed full of broken branches and small wood; being light in weight, they are rolled before soldiers in the trenches, and afford some, though not a very efficient, protection against musketry fire.

Gabionnade is a line of gabions thrown up by troops as a defence, after being driven back from other more solid positions. In carrying a well-defended fortress, gabionnade after gabionnade has sometimes to be stormed before the besieged can be compelled to surrender.

GABLE, the triangular part of an exterior wall of a building between the top of the side-walls and the slopes of the roof. The whole wall of which the gable forms the top is called a gable-end; party-walls, or the walls which separate two contiguous houses, and which belong equally to both houses, are called in Scotland 'mutual gables.'

The gable is one of the most common and characteristic features of Gothic architecture. The end walls of classic buildings had *Pediments* (q. v.), which followed the slope of the roofs, but these were always low in pitch. In medieval architecture, gables of every angle are used with the utmost freedom, and when covered with the moulded and crocketed copes of the richer periods of the style, give great variety and beauty of outline.

Gablets, or small gables, are used in great profusion in the more decorative parts of Gothic architecture, such as canopies, pinnacles, &c., where they are introduced in endless variety along with tracery, crockets, and other enrichments.

The towns of the middle ages had almost all the gables of the houses towards the streets, producing great diversity and picturesqueness of effect, as may still be seen in many towns which have been little modernised. The towns of Belgium and Germany especially still retain this medieval arrangement. In the later Gothic and the Renaissance periods, the simple outline of the gable became stepped and broken in the most fantastic manner. See Corbie Steps.

In Scottish law, a mutual gable or party-wall, though partly built on the adjoining property, belongs to the builder, and he can prevent his neighbour from availing himself of it for the support of his house, until he has paid half the expense of building it. For the law of England on this subject, see Party-wall.

GABOO'N RIVER, The, takes its rise in the Crystal Mountains, a chain in Western Africa, running almost directly east and west, parallel to, and about 80 or 100 miles distant from, the coast. Flowing first in the direction of north to south, it afterwards curves toward the north, and empties itself into the Atlantic in lat. about 0° 30′ N., and long. 9° 10′ E. Its mouth forms a bay of some 10 or 12 miles in length, with a breadth varying from 7 to 15 miles. The total length of the river is said to be about 120 miles. The G. is deep and sluggish, the mass of its waters being tidal; 60 miles from its mouth the tide rises to a height of from seven to nine feet. The climate is unhealthy; but the profits of the trade in ivory, which is obtained abundantly in the territories through which the river flows, induced a French colony to settle and build a fort at the mouth of the river in 1842 or 1843. In the same year, an American mission, which still continues in active operation, was established at Baraka, about eight miles up the river. The Gaboon country, besides ivory—of which, when the home demand is brisk, it yields about 80,000 pounds annually—produces ibar-wood, a dye-wood from which a dark-red dye is obtained, ebony, and copal of inferior quality. The banks of the river, from its source to the ocean, are occupied by about a dozen tribes, chief of which is the Mpongeve, who hold its mouth. This division of territory renders the ivory much more costly than it otherwise would be, the first owners in the interior not being allowed to take it direct to the white trader at the coast, but compelled to transmit it through the hands of the intervening tribes, each of whom makes a profit.

GABRIEL (Heb. the man or mighty one of God) is, in the Jewish angelology, one of the seven archangels. He appears in the book of Daniel as the interpreter of the prophet's vision (chap. viii.), and announces the future appearance of the Messiah (chap. ix. 21—27). In the New Testament, he reveals to Zacharias the birth of John the Baptist (Luke, i. 11), and to the Virgin Mary the birth of Christ (Luke, i. 26). According to the Rabbins, he is the angel of death for the people of Israel, whose souls are intrusted to his care. The Talmud describes him as the prince of fire, and as the spirit who presides over the thunder and the ripening of fruits. When Nebuchadnezzar besieged Jerusalem, G. is believed to have entered the Temple, by command of Jehovah, before the Assyrian soldiery, and burned it, thereby frustrating their impious intentions. G. has also the reputation among the Rabbins of being a most distinguished linguist, having taught Joseph the 70 languages spoken at Babel, and being, in addition, the only angel who could speak Chaldee and Syriac. The

Mohammedans hold G. in even greater reverence than the Jews, and regard him as the chief of the four most favoured angels who form the council of God; he is called the spirit of truth, and is believed to have dictated the Koran to Mohammed.

GACHARD, Louis Prosper, principal archivist of Belgium, was born in France about the year 1800. He was originally a compositor; but having removed to Belgium, he took part in the revolution of 1830, and was naturalised in 1831. In the same year he was appointed to the useful and honourable post which he still retains (1862). G. has spent much time in examining the documents relating to Belgian history, which are to be found in the national archives and in those of Spain. His principal writings are, *Analectes Belgiques* (1830); *Documents Politiques et Diplomatiques sur la Révolution Belge de* 1790 (1834); *Mémoires sur les Bollandistes et leurs Travaux depuis* 1773 *jusqu'en* 1789 (1847); *Correspondance de Guillaume le Taciturne* (1847—1851); *Correspondance de Philippe II., sur les Affaires des Pays-Bas* (1848—1851); *Correspondance du Duc d'Albe sur l'Invasion du Comte Louis de Nassau en Frise* (1850); *Retraite et Mort de Charles-Quint* (1854), and *Relation des Troubles de Gand sous Charles-Quint* (1856). Prescott, the American historian, speaks highly of G., and of the importance of his labours in regard to the history and character of the Emperor Charles V. See Prescott's edition of Robertson's *History of Charles V.* (Boston, 1857). Recently (1859), G. published a series of historical documents bearing unfavourably upon the characters of Counts Egmont and Horn, which had the effect of stopping proceedings in regard to the erection of a national monument to these two noblemen.

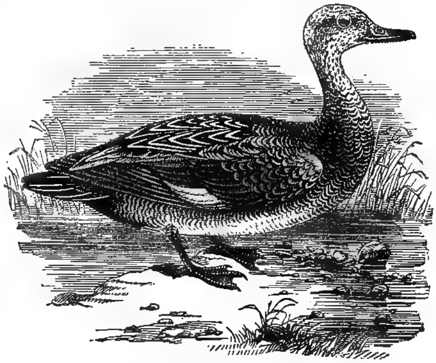
GAD, the first-born of Zilpah, Leah's maid, was the seventh son of Jacob. His name is differently explained.—The *tribe* of Gad numbered in the wilderness of Sinai more than 40,000 fighting-men. Nomadic by nature, and possessing large herds of cattle, they preferred to remain on the east side of Jordan, and were reluctantly allowed to do so by Joshua, on condition of assisting their countrymen in the conquest and subjugation of Canaan. Their territory lay to the north of that of Reuben, and comprised the mountainous district known as Gilead, through which flowed the brook Jabbok, touching the Sea of Galilee at its northern extremity, and reaching as far east as Rabbath-Ammon. The men of Gad—if we may judge from the eleven warriors who joined David in his extremity—were a race of stalwart heroes; 'men of might, and men of war fit for the battle, that could handle shield and buckler, whose faces were like the faces of lions, and were as swift as the roes upon the mountains' (1 Chron. xii. 8). Jephthah the Gileadite, Barzillai, Elijah the Tishbite, and Gad '*the* seer,' were also in all probability members of this tribe.

GADA'MES, or more accurately **GHADAMES** (the *Cydamus* of the Romans), the name of an oasis and town of Africa, the centre of divergent routes to Tunis, Tripoli, Ghat, and Tidikelt, is situated on the northern border of the Sahara, in lat. 30° 9′ N., long. 9° 17′ E., on the south-western boundary of the pashalic of Tripoli, and 310 miles south-west of the town of that name. It contains six mosques and seven schools; but the education offered to the young is limited to the reading of the Koran and a little Arabic writing. The gardens of G. grow dates, barley, wheat, millet, &c., and are watered by the hot spring (89° Fah.), from which the town had its origin. The climate is dry and healthy, though very hot in summer. The revenue of G., estimated at 10,000 mahboobs (£1700), is derived from annual tributes levied on property, and from custom dues and tolls. It is an important entrepôt for manufactures and foreign goods from Tripoli to the interior, and for exports of ivory, bees-wax, hides, ostrich-feathers, gold, &c., from the interior to Tripoli. Previous to 1856, about 500 slaves, principally females, were annually imported at G.; but in that year a decree was issued by the sultan, peremptorily forbidding the traffic, which accordingly has been completely abolished. Pop. 4000, who are devoted Mohammedans.

GAD-FLY. See Bot and Tabanus.

GA'DIDÆ, an important family of malacopterous fishes, having a moderately elongated body covered with small soft scales, the head naked, the fins all soft and destitute of spines, the ventral fins placed under the throat and pointed, one dorsal fin or more, the air-bladder large. Some of the species are small, but others attain a large size. To this family belong the Cod, Ling, Hake, Dorse, Haddock, Whiting, Coal-fish, Burbot, &c. The species are widely distributed. Most of them are marine. A few, as the Burbot, are fresh-water fishes. The more important species are separately noticed.

GA'DWALL (*Anas strepera*, or *Chauliodus strepera*), a species of duck, not quite so large as the mallard, a rare visitant of Britain, but abundant in many parts of the continent of Europe, and equally so in Asia and in North America. It is also found in the north of Africa. Being a bird of passage, it is a native both of arctic and of tropical regions. The G. breeds in marshes, and lays from seven to nine eggs. Except at the breeding season, it is usually seen in small flocks, and an individual is sometimes to be found in a flock of other ducks. Its voice is loud and harsh. It is much esteemed for the table, and is common in the London market, being imported chiefly from Holland.



Gadwall (*Anas strepera*).

GÆA, or **GE**, according to the Greek mythology, the goddess of the earth, appears in Hesiod as the first-born of Chaos, and the mother of Uranus, Pontus, and many other gods and titans. As the vapours which were supposed to produce divine inspiration rose from the earth, it was natural that G. should be regarded as an oracular divinity; and, in fact, the oracles at Delphi and Olympia were believed to have belonged to her in the earlier ages of their history. Her worship extended over all Greece, and she had temples or altars in most of the important cities. At Rome, G. was worshipped under the name of *Tellus*.

GAELIC LANGUAGE and LITERATURE. The term Gaelic (Gwyddelian or Gadhelic) is used in two senses. In its wider signification, it designates the northern branch of the Celtic languages, comprehending the Irish, the Highland-Scottish, and the Manx. See CELTIC NATIONS and IRISH LANGUAGE AND LITERATURE. In its narrower signification, it designates the Highland-Scottish dialect, also known by the name of Erse or Irish. Mr W. F. Skene, one of the latest and best informed writers on the subject, holds that the differences between the language spoken by the Scotch Highlanders and the language spoken by the native Irish are (1) 'partly in the *pronunciation*, where the accentuation of the language is different, where that peculiar change in the initial consonant, produced by the influence of the previous word, and termed by the Irish grammarians eclipsis, is unknown except in the sibilant, where the vowel sounds are different, and there are even traces of a consonantal permutation; (2) partly in the *grammar*, where the Scottish Gaelic prefers the analytic form of the verb, and has no present tense, the old present being now used for the future, and the present formed by the auxiliary verb, where the plural of one class of the nouns is formed in a peculiar manner, resembling the Anglo-Saxon, and a different negative is used; (3) partly in the *idioms* of the language, where a greater preference is shewn to express the idea by the use of substantives, and the verb is anxiously avoided; and (4) in the *vocabulary*, which varies to a considerable extent, where words now obsolete in Irish are still living words, and others are used in a different sense.'—*The Dean of Lismore's Book*, introd. pp. xiv. xv. (Edin. 1862).

The origin of the differences thus described is a question still in dispute. Mr Skene contends that they are ancient, and enter into the organisation of the language. The Irish scholars, on the other hand, hold that they are comparatively modern and unimportant, and little more than provincial corruptions of the mother-language of Ireland. The late Mr Richard Garnett, one of the most learned of English philologists, is on the Irish side, holding 'that Irish is the parent tongue, that Scottish Gaelic is Irish stripped of a few inflections, and that Manx is merely Gaelic with a few peculiar words, and disguised by a corrupt system of orthography;' and, again, that the language of the Scottish Highlands 'does not differ in any essential point from that of the opposite coast of Leinster and Ulster, bearing, in fact, a closer resemblance than Low German does to High German, or Danish to Swedish.'—*Philological Essays*, pp. 202, 204 (Lond. 1859). That the north of Ireland, and the Scottish Highlands and West Islands, were, at an early period, peopled by the same race, or races, is admitted on both sides. Mr Skene further admits, that from about the middle of the 12th c. to about the middle of the 16th c., Ireland exercised a powerful literary influence on the Scottish Highlands; that the Irish sennachies and bards were heads of a school which included the West Highlands; that the Highland sennachies were either of Irish descent, or, if they were of native origin, resorted to bardic schools in Ireland for instruction in the language and the accomplishments of their art; that in this way the language and literature of the Scottish Highlands must have become, by degrees, more and more assimilated to the language and literature of Ireland; and that it may well be doubted whether, towards the middle of the 16th c., there existed in the Scottish Highlands the means of acquiring the art of writing the language except in Ireland, or the conception of a written and cultivated literature, which was not identified with the language and learning of that island. Mr Skene holds, at the same time, that a vernacular Gaelic, preserving many of the independent features of a native language, existed among the Scottish Highlanders as a spoken dialect; and that a popular and unwritten literature existed in that native and idiomatic Gaelic, in the poetry handed down by tradition, or composed by native bards innocent of all extraneous education in the written language of Ireland.

The first books printed for the use of the Scottish Highlanders were a translation of Knox's Prayer Book in 1567, by John Carswell, Bishop of the Isles; a translation of Calvin's Catechism, in 1631; a translation of the Psalms of David, begun in 1659, and completed in 1694; and a translation of the Bible, published by the Rev. Robert Kirke, minister of Balquhidder, in 1690. All these works are in the Irish orthography and Irish dialect; the last-mentioned work, indeed, is nothing more than a reprint of Bishop Bedell's Irish version of the Bible, with a short vocabulary of Scottish Gaelic words, to adapt it to the use of the Scottish Highlanders.

The first translations into the Scottish Gaelic were of Baxter's *Call to the Unconverted*, published in 1750; of the Psalms of David, in 1753, in 1787, and in 1807; of the New Testament, in 1767 and 1796; of Alleine's *Alarm*, in 1781; of the Old Testament, in 1783—1787, and in 1820; and of the Old and New Testaments, in 1826.

Vocabularies of the Scottish Gaelic were published in 1690, in 1702, in 1741, in 1795, and in 1815. The first Dictionary, by R. A. Armstrong, appeared in 1825; the largest and best was published under the auspices of the Highland Society of Scotland, in two quartos, in 1828. The best grammar is that of the Rev. Alexander Stewart, minister at Dingwall, published in 1801, and reprinted in 1812.

The oldest written poetry in the Scottish Gaelic is preserved in *The Dean of Lismore's Book*, written between 1511 and 1551, by Sir James Macgregor, vicar of Fortingall, and Dean of Lismore. It is now in the Advocates' Library at Edinburgh. Selections from it have been published at Edinburgh during the present year (1862), with translations by the Rev. Thomas M'Lauchlan, as well into English as into modern Scottish Gaelic, and with a preliminary dissertation by Mr W. F. Skene. The volume contains nine pieces ascribed to 'Ossian, the son of Finn,' who speaks of himself as contemporary with St Patrick, and pieces by later and less known writers, including a few of knightly or noble rank, such as Gerald Fitzgerald, fourth Earl of Desmond, in Ireland; Isabella Campbell, wife of the first Earl of Argyle; and 'Duncan MacCailein, the Good Knight,' believed to be Sir Duncan Campbell of Glenurchy. The literary merit of the compositions is very slender.

The bibliography of the scanty literature of the Scottish Gaelic will be found in Reid's *Bibliotheca Scoto-Celtica* (Glasg. 1832). The modern names of most note are those of Robert Calder Mackay, or Robb Donn, as he is more commonly called in his native Sutherland, whose poems were published at Inverness in 1829; and Duncan Ban McIntyre, of Glenorchy, whose poems were published at Glasgow in 1834. The former was born in 1714, the latter in 1724; both were self-educated. The traditional prose literature has been collected and illustrated by Mr J. F. Campbell of Islay, in three pleasing volumes, *Popular Tales of the West Highlands* (Edin. 1860—1862).

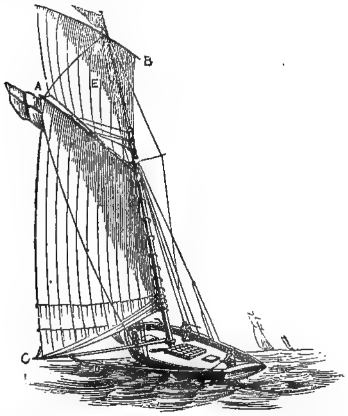
Mr Skene has very clearly and fairly stated the long-disputed question as to the authenticity of the famous Poems of Ossian, published first in English, and afterwards in Gaelic, by Mr James Macpherson. The conclusions arrived at are: 1. That the characters introduced into Macpherson's poems were not invented by him, but were really the subjects of tradition in the Highlands; and that poems certainly existed which might be called Ossianic, as relating to the persons and events of that mythic age. 2. That such poems, though usually either entire poems of no very great length, or fragments, had been handed down from an unknown period by oral recitation, and that there existed many persons in the Highlands who could repeat them. 3. That such poems had likewise been committed to writing, and were to be found to some extent in manuscripts. 4. That Macpherson had used many such poems in his work; but by joining separated pieces together, and by adding a connecting narrative of his own, had woven them into longer poems, and into the so-called epics.

The Scottish Gaelic speech is everywhere gradually, and in some places rapidly, losing ground; but it is still used, wholly or partially, in the public religious services of about 180 out of about 1000 congregations of the Church of Scotland.

GAETA (the Cajeta of the Latins), a strongly fortified maritime town of the Neapolitan province Terra di Lavoro, is picturesquely situated on an abrupt promontory projecting into the Mediterranean, and connected with the mainland by a low and narrow isthmus protected by solid walls. On the summit of the promontory stands the circular tower D'Orlando, said to be the ancient mausoleum of Lucius Munatius Plancus, the friend of Augustus. The beauty of the bay of G., which almost rivals that of Naples, has been celebrated by Homer, Virgil, and Horace. Cajeta, the ancient name of G. derives its origin, according to Virgil, from its being the burial-place of Cajeta, the nurse of Æneas. On the dismemberment of the Roman empire, G. became a centre of civilisation and commercial prosperity, and reached still further importance after the decadence of the eastern empire. In the growth of this early municipality is foreshadowed the commercial life and grandeur of the later Italian republics. Both in ancient and modern times, G. has sustained remarkable sieges, and recently it has been the theatre of several interesting events. In 1848, it became the refuge of Pope Pius IX., when the revolution at Rome compelled him to retire. In 1860, after the defeat of the Neapolitans on the Volturno by the forces of Garibaldi, G. was the last stronghold of the Bourbon dynasty of Naples, and surrendered after a protracted siege to General Cialdini. Many interesting classic remains have been found in G., including a fine marble vase by the Athenian sculptor Salpione. Its vicinity abounds in remains of Roman villas, &c. The citadel, which is of great strength, contains in its tower the tomb of the Constable Bourbon, killed at the taking of Rome in 1527. The inhabitants of G., who number about 15,000, derive their chief profits from the fisheries and their coasting-trade in oil, wine, and fruit—the chief productions of the surrounding country.

GÆTU'LIA, an ancient country of Africa, situated south of Mauritania and Numidia, and embracing the western part of the desert of Sahara. Its inhabitants belonged to the great aboriginal Berber family of North and North-western Africa; they were not in general black, though a portion of them dwelling in the extreme south, towards the Niger, had approximated to this colour through intermixture with the natives and climatic causes, and were called *Melanogætuli*, or 'Black Gætulians' (see Ptol. iv. 6, s. 16). The Gætulians were savage and warlike. They came into collision with the Romans for the first time during the Jugurthine war, when they served as light-horse in the army of the Numidian king. Cornelius Cossus Lentulus led a force against them, and for his success obtained a triumph and the surname of Gætulicus (6 A. D.). The ancient Gætulians are believed to be represented in modern times by the Tuaricks or Tawâreks.

GAFF, in a ship or boat, the spar to which the head of a fore-and-aft sail is bent, such sail having its foremost side made fast by rings to the mast, and its lower edge, in most instances, held straight by a boom. The thick end of the gaff is constructed with 'jaws' to pass half round the mast, the other half being enclosed by a rope; this serves to keep it close when the sail is hoisted or lowered. A gaff, with the sail called 'driver' or 'spanker,' and the gaff-topsail, which is a small sail carried on the topmast above the gaff, are shewn in the accompanying illustration.



A, Gaff; B, Gaff-topsail-yard; C, Boom; D, Sheet; E, Gaff-topsail.

GAFFLES, a name applied to the levers by means of which cross-bows were bent.

GAGE, Thomas, an English general, who became governor of Montreal in 1760, and in 1763 succeeded general (afterwards Lord) Amherst as commander-in-chief of the British army in America. In 1774, when the difficulties between the colonies and Great Britain had already become very serious, General G. was appointed governor of Massachusetts. In peaceful times, his administration might in all probability have been popular and successful; but he was unequal to the exigencies of that trying period. It may indeed be doubted whether any one, whatever his abilities, could, while restricted to the rigorous policy of the home government, have succeeded in preserving the colony to the English crown. In April 1775, General G. sent an expedition to seize the military stores at Concord, and thus provoked the battle of Lexington, the first explosion of the American revolution. Soon after (May 5) the provincial congress resolved that 'no obedience was in future due to him [Gage], and that he ought to be guarded against as an unnatural and inveterate enemy.' According to Bancroft, 'Gage was neither fit to reconcile nor to subdue.' He was recalled, and sailed for England in the autumn of 1775. He died in 1787.

GAGE (Lat. *vadium* or *wadium*) signifies a pawn or pledge, and is derived, says Cowel, from the French *gager*. Hence, by changing *g* into *w*, we have *wage* and *wager;* as 'wager of law,' 'wager of battle,' wherein a person gave his pledge that he would sustain his affirmation; and, in the latter case, the glove was sent as a material pledge to be redeemed by mortal combat. Hence also in England

Estate in Gage, which was of two kinds—*vivum vadium*, and *mortuum vadium*. See Mortgage. *Vivum vadium* was where an estate in lands was given in security of a debt, on condition that the estate should remain with the lender until he had made good the sum lent out of the profits of the land. So as in this case neither money nor land dieth or is lost, and therefore it is called *vivum vadium* (Co. Litt. 205 a). This mode of giving security has long gone out of use; yet there is no doubt that it was the original method in observance before the transaction assumed the form of a mortgage. It exactly corresponds with the Scotch form of a pure Wadset (q. v.).

GAGE, or **GAUGE**, an apparatus for measuring any special force or dimension; thus we have *pressure-gage*, *wind-gage* (see Anemometer), *rain-gage* (q. v.), *wire-gage*, *button-gage*, &c. The simplest form of gage of dimension is the common *wire-gage*, by which the diameter of wire is measured. It is simply an oblong plate of steel, with notches of different widths cut upon the edge; these are numbered, and the size of the wire is determined by trying it in the different notches until the one is found which it exactly fits. The thickness of sheet-metal is tried by the same gage. There is a great want of uniformity in these gages—the Birmingham gage for iron-wire, sheet-iron, and steel differing from that used for brass, silver, gold, &c.; and these again from the Lancashire gages. It has been proposed, in order to obtain uniformity, and to enable definite descriptions and orders to be given with accuracy and certainty, that instead of the arbitrary numbers of varying signification now in use, decimal parts of an inch, tenths, hundredths, thousandths, or still smaller fractions, if necessary, be used, and that these be used for all diameters and thicknesses, such as wires, sheet-metals, buttons, watch-glasses, &c.; but such a scale has not yet come into general use. The gage commonly used for buttons, watch-glasses, and such like large diameters, is a rule with a groove cut lengthwise down the middle. Another metal rule, with a brass head, slides in this, and by means of a thumb-pin, may be pushed out at pleasure. The object to be measured is placed between *a* and *b* (fig. 1), and the width of this space is measured by graduations on the middle metal slide.

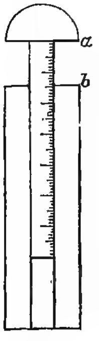


Fig. 1.

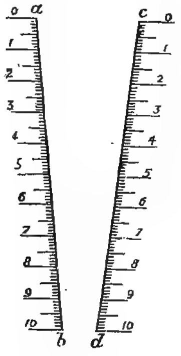


Fig. 2.

A very elegant and delicate gage has recently come into use for measuring watch-glasses, and is applicable to many other purposes. On an oblong piece of sheet-metal, two straight metal ridges are fixed in such a manner that they shall be inclined at a given angle to each other, as *ab* and *cd* (fig. 2). Now, let us suppose the angle to be such that the distance between *a* and *c* is 2 inches, and that between *b* and *d* is 1 inch, while the lengths *ab* and *cd* are 10 inches. It is evident that for every inch of descent from *a* and *c* towards *b* and *d*, there will be a narrowing equal to $\frac{1}{10}$ of an inch; and for every tenth of an inch of such descent, there will be a narrowing of $\frac{1}{100}$ of an inch, and so on: thus we may, by graduating downwards from *ac* to *bd*, measure tenths by units, hundredths by tenths, and so on to still finer quantities if required. This is applicable to lengths as well as diameters. By means of fine screws with large graduated heads, Messrs Whitworth have measured small pieces of steel to the one-millionth of an inch (see Micrometer). Pressure-gages, wind-gages, &c. will be treated under the special subjects.—In railways, the gauge means the distance between the rails. See Railway.

GAGERN, Heinrich Wilhelm August, Freiherr von, was born at Baireuth, 20th August 1799, and educated at the military school of Munich. On Napoleon's return from Elba, G. entered the army of Nassau, and served as lieutenant at Waterloo. After the peace, he devoted himself to the study of law at the universities of Heidelberg, Göttingen, Jena, and Geneva. On returning home in 1821, he entered political life under the government of Grand-ducal Hesse, and after passing through several public offices, was elected a member of the Second Chamber in 1832, in which position he vigorously opposed the politics of the governments and of the Federal Diet. In 1835, the government succeeded in obtaining a majority, but G. continued to be re-elected; until, at the close of the following year, seeing the fruitlessness of his opposition to the governmental politics, he declined re-election, and took a lease of his father's estate at Monsheim, with a view to the practical study of agriculture. In 1846, G. again appeared before the public in a work against the government of electoral Hesse, which had been legislating in defiance of the constitution of the electorate. In the following year, he was elected into the Chamber again as representative of Worms, and his return to public life gave such a fresh impulse to liberal politics, that in 1848 the elections returned more opponents of the government than they had done since 1832. The life of G. became now inseparably connected with the memorable German movement of 1848. He took the lead on 27th February, by introducing a motion into the Chamber to promote the representation of the German people in the Frankfort Diet. When the preparatory convention of delegates (*das Vorparlament*) from the German states assembled at Frankfort on 31st March, G. took the most prominent part in its deliberations, and on the meeting of the parliament (28th May) (see Germany), he was appointed president, and continued to be re-elected every month till he was called to the perpetual presidency. Displaying more of the qualifications of a practical statesman than were possessed by most of the leading men who joined in this movement, G. struggled on amid all the divisions into which his party separated, and all the difficulties presented by the governments. But unable, on the one hand, to sympathise with the violence of the democratic party, and, on the other, to come to an understanding with the governments, he abandoned the movement altogether on the 20th May 1849. In 1850 he served as major in the Slesvig-Holstein war, and when the campaign was over, retired to the Monsheim estate, which had now come into his possession by his father's death. In 1852 he sold his estate, and removed with his family to Heidelberg, where he has since resided.

GAGING, or **GAUGING**. When this term is used without qualification, it refers specially to the gaging of the contents of casks; and in many places, the popular name for the excise officer who measures the contents of casks containing excisable liquors is 'gauger.' Sliding scales, which are graduated according to the mathematical rules for determining the solid contents of regular solids approximating to the form of the casks, are used, but considerable practice and skill are required to apply them with accuracy.

GAILLAC, a town of France, in the department of Tarn, and on the right bank of the river of that name, is situated in a fertile vine-growing district, 32 miles north-east of Toulouse. It is ill built, and has no public building of any importance except the communal college. Distilling, tanning, ship-building, and a brisk trade in wine and brandy are carried on. Pop. (1857) 5503.

GAILLARD, Gabriel Henri, a French historian, was born at the village of Ostel, near Soissons, 26th March 1726. He was educated for the bar, but soon abandoned it for literature, and afterwards turned his attention exclusively to history. His first work was entitled *Essai de Rhêtorique Française à l'Usage des jeunes Dêmoiselles*, &c. (1745), and the favourable reception which it met with induced him to publish his *Poêtique Française à l'Usage des Dames*. In 1757 appeared his *Histoire de Marie de Bourgogne, Fille de Charles le Têmêraire;* which was followed, in 1766, by the *Histoire de François I.*, and in 1782 by the *Histoire de Charlemagne, précédée de Considêrations sur la première Race, suivie de Considêrations sur la seconde Race, et contenant l'Eloge du Premier President de Lamoignon*. In a diffuse, one-sided, and rhetorical style, he represented the relations of France to England and Spain in his *Histoire de la Rivalité de la France et de l'Angleterre* (1771—1777) (which procured his admission into the French Academy), and *Histoire de la Rivalité de la France et de l'Espagne*. G. was the author of many other works. He wrote *éloges* on Malesherbes (his intimate friend), Descartes, Charles V., Henry IV., Corneille, Molière, &c. He died 13th February 1806.

GAI'NSBOROUGH, a market-town and seaport of England, in the county of Lincoln, is situated on the right bank of the Trent, about 20 miles above the embouchure of that river in the Humber mouth, and 16 miles north-west of Lincoln. It is a well-built town, consisting mainly of one long street, running parallel with the river, which is here spanned by a fine stone bridge of three elliptical arches. It was constituted a port in 1841. The most interesting of the buildings of G. is that called the Old Hall, a curious structure composed of oak timber framing, and forming three sides of a quadrangle. It is said to have been occupied, or held in property, by the several lords of the manor of G. ever since the Saxons established themselves in this neighbourhood. Among the other public buildings are the parish church—which, with the exception of a fine old tower, dating from the 12th c., was rebuilt in 1736, and the town-hall. There are also a grammar school, established in 1589, and other educational institutions; a literary institute, and several libraries. G. is favourably situated in a commercial point of view, vessels of 200 tons being able to reach its wharfs by the river, while by means of the Keadby, the Chesterfield, and other canals, it maintains communication with the interior of the country. In 1860, 530 vessels of 25,801 tons entered and cleared this port. G. has important manufactures of linseed oil, and carries on malting, rope-making, and ship-building extensively. Pop. (1861) of parl. borough, 6202; of township, 7700.

GAINSBOROUGH, Thomas, one of the most eminent English landscape-painters, was born at Sudbury, in the county of Suffolk, 1727, and early displayed a decided talent for painting. 'Nature,' it has been said, 'was his teacher, and the woods his academy, where he would pass his mornings alone, making sketches of an old tree, a marsh, brook, a few cattle, a shepherd and his flock, or any other objects that casually came in view.' At 14 years of age, he was sent to London, where he was for some time with Mr Gravelot, the engraver, and afterwards with Hayman. At 19, he married, and set up in Bath as a portrait-painter, in which capacity he was very successful; but his genius first found adequate expression in the delineation of the rich and quiet scenery of his native country, and to this he mainly devoted himself after leaving Bath for London, in 1774. On the institution of the Royal Academy, G. was chosen one of the first members, but never took much interest in its proceedings. He died August 2, 1788, of a cancer in the neck. His last words exhibited more the enthusiasm of the painter than the logic of the theologian: 'We are all going to heaven, and Vandyck is of the party.' G.'s portraits are remarkable as 'striking likenesses,' but are not carefully finished. The best are those of the Royal Family, of Abel the composer, and Quin the actor. His fame, however, rests chiefly on his landscapes; in these, he shews himself a faithful adherent to nature, as he knew it in his own beautiful island. He is, in fact, to be regarded as the first truly original English painter, and, in the opinion of Sir Joshua Reynolds, fit to be the head of an English school. Among his finest productions are, 'The Shepherd's Boy,' 'The Fight between Little Boys and Dogs,' 'The Seashore,' and 'The Woodman in the Storm.' His most celebrated picture is 'The Blue Boy,' in the Devonshire Gallery.

GAIUS, a Roman jurist, most probably of the age of the Antonines, and the chief source of our knowledge of Roman law prior to Justinian. Considering the important place which he holds in ancient legal literature, it is strange that his personal history should be almost entirely unknown, and that almost every circumstance connected with him should be a subject of controversy. The discussion as to whether the name is properly *Gaius* or *Caius* is a mere verbal dispute; but the questions regarding his country, his condition, and even his religion, have been canvassed at considerable length. From his being uniformly called by the single appellation G., it has been inferred that he was either a foreigner or a freedman: from his familiarity with the Greek language, some have argued that he was of Greek origin; from his being cited as 'our' G. by Justinian, who was a native of Illyricum, it is argued by some that G. must have been an Illyrian by birth; while others, arguing from the same fact, and from other equally inconclusive data, have even set him down as a Christian. That the last inference is a false one, cannot admit of a moment's doubt; the others, even if it were possible to settle them definitively, are of no practical importance. As to the precise age of G., thus much is certain, that before the revision of the Roman laws, and the reform of the legal studies by Justinian, the *Institutions* of G., as well as four other of his treatises, were the received text-books of the schools of law. His *Institutions*, moreover, formed the groundwork of the *Institutions* of Justinian. From his being thus preferred to Ulpian or Papinian, it is not to be inferred that he lived after them, but only that his work was more popular. The latest jurist whom he cites is Salvius Julianus, who lived under Hadrian, and the latest imperial edict is one of Antoninus Pius, whence it may fairly be concluded that he survived Antoninus, and probably wrote under his successor.

The works of G. were largely used in the compilation of the *Digest*, which contains no fewer than 535 extracts from his writings. The principal are, the *Edictum Provinciale*, in thirty-two books; the *Aurea*, in seven; the *Edictum Urbicum; On Trusts; On Mortgages;* and, above all, the *Institutions*, in four books. The last-named work is that by which G. is chiefly known, and it was probably the earliest complete and systematic text-book of Roman law. Although it was the basis of Justinian's Institutions, both as to its matter and its division, yet it was completely superseded by that work, and after a time was entirely lost, the only knowledge of it which remained being that which was gathered from the detached extracts in the *Digest*, and from the *Breviarium Alaricianum*, or code of the Visigoths, which was known to be derived from it. The recovery of this long lost work, therefore, would in any circumstances be considered a fortunate event; but the *Institutions* of G. draw additional interest from the remarkable manner in which it has been restored to literature. It had long been known that the MSS. in the library of the chapter of Verona were specially curious in the matter of jurisprudence; and in 1816, Niebuhr, while on his way to Rome, discovered, in a palimpsest MS., the later writing of which was a copy of St Jerome's epistles, portions of the work of some ancient jurisconsult, the value of which he at once recognised, and the specimen page of which, as copied by him, was soon afterwards pronounced by Savigny to be a portion of the *Institutions* of Gaius. On the publication of his report, the Berlin Academy of Sciences commissioned two German scholars, Göschen and Hollweg, in 1817, to make a copy of the entire palimpsest, which consists of 127 sheets. It was a work of immense labour. The original writing had been very carefully washed, and in many pages scraped out; the lines of the second writing did not cross the original, as often happens in palimpsests, but ran in the same direction, and frequently over it; while 63 pages of the palimpsest had actually been written three times, G. having been erased to make room for a theological treatise, which in its turn was scraped out to make room for St Jerome! It reflects no small credit on the skill and patience of the copyists that they succeeded in recovering so much as nine-tenths of the entire work, which was published in 1821 by Göschen, and again, after a fresh collation of the MS. by Blume, in 1824; a third and much improved edition, by Lachmann, appeared in 1842. A comparative edition of the *Institutions* of G. and of Justinian, by Klenze and Böcking, had appeared at Berlin in 1829.

The *Institutions* of G. are divided into four books, of which the first is devoted to the law of persons, the second and third to the law of things, and the fourth to the law of actions. The first book was translated into German in 1824 by Von Brockdorff, and the entire work has been translated into French three several times—by Baulet in 1826, by Domenget in 1843, and by Pellat in 1844. In England, it has attracted but little notice, except in a few of the critical journals, and there chiefly as a literary curiosity; nor has any English translation of the work hitherto appeared.

The *Lex Romana Wisigothorum*, or *Breviarium Alaricianum*, is in substance a recast of the *Institutions* of G., published in 506 by Alaric for the use of the Roman subjects of the west Gothic kingdom. It is chiefly curious as illustrating the analogies and the discrepancies of Roman and barbarian law, and as supplying the germ of many of the medieval institutions by which Roman practice was supplanted. See, in addition to the editions of the *Institutions* enumerated above, Huschke, *Zur Kritik und Interpretation von Gaius Institutionen*, in his *Studien des Römischen Rechts;* also Mackeldey's *Lehrbuch des Römischen Rechts;* and Savigny, *System des heutigen Röm. Rechts.*

GALA WATER, a small river of Scotland, 21 miles in length, rises among the Moorfoot Hills in Edinburghshire, flows in a south-south-east direction through a beautiful and romantic country, and, forming in the lower portion of its course the boundary between Selkirk and Roxburgh shires, unites with the Tweed near Abbotsford.

GALA'CTIC CIRCLE (see GALAXY). This circle is to sidereal what the invariable ecliptic is to planetary astronomy, the ground plane of the sidereal system.

GALACTODENDRON. See COW-TREE.

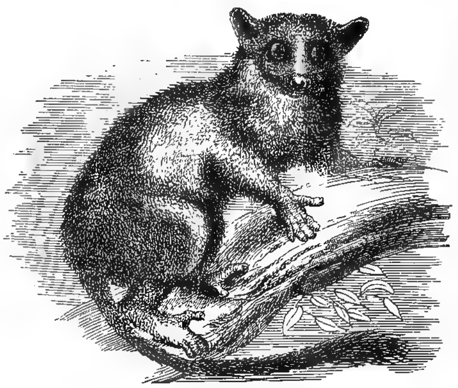
GALACTO'METER, or **LACTOMETER**, a very simple instrument for testing the richness of milk; it consists of a glass-tube, graduated to 100 parts. New milk is poured in up to the top of the graduated part, and allowed to stand; and when the cream has completely separated, the value of its quantity is shewn by the number of parts in the 100 which it occupies. Another form of instrument was invented by Döeffel, consisting of a small hydrometer with a scale two inches long divided into 20 degrees, the zero being placed at the point which the instrument sinks in water, and the 20th degree corresponding with the density 1·0383. This instrument is preferred by the continental chemists; and 14° is held to shew milk undiluted with water.

GALACZ, an important town of Moldavia, and the only port of the province, is situated on the left bank of the Danube, about three miles below the confluence of the Sereth with that river. Though it has better houses than most Moldavian towns, it cannot be said to be well built. It has numerous churches, a large bazaar, always well filled with merchandise, and a great number of store-houses for grain and other produce. It was made a free port in 1834, and is the chief entrepôt for the commerce carried on between Germany and Constantinople. Steamers passing G. ply regularly between Vienna and Constantinople, and vessels of 300 tons come close up to the town. The principal articles of export are maize, wheat, rye, tallow, wool, masts and spars, timber, and preserved meat; and the imports are chiefly British manufactures and twist, sugar, raisins, and figs, oil, coal, iron, and tobacco. In 1858, 494 laden vessels cleared at the port of Galacz. The value of the imports and exports for 1852—1855 inclusive was as follows:

Years.	Imports.	Exports.
1852,	£441,759	£567,110
1853,	559,440	542,080
1854,	121,440	148,280
1855,	624,880	1,174,360

Several British commercial houses have been established in Galacz. Pop. 40,000.

GALA'GO (*Galago* or *Otalicnus*), a genus of mammalia of the Lemur family, remarkable for the great length of the hind-legs and the great size of the ears, which are membranous, and capable of being folded down as in bats. The head is rounded, the muzzle short, the eyes very large; all the feet have five toes; all the nails are flat, except those of the first digits of the hind feet, which are armed with sharp claws; the tail is very long, and almost bushy. The species are natives of Africa and Madagascar, varying from the size of a rabbit to that of a rat, more or less nocturnal in their habits, very lively and active, feeding partly on fruits and partly on insects; one of them (*G. Senegalensis*) is known in Senegal as the *gum animal*, from living much in acacias, and feeding, or being supposed to feed, on their gum. 'These pretty animals have all the activity of birds, leaping from bough to bough. They watch insects flitting among the leaves, listen to the fluttering of the moth as it darts through the air, lie in wait for it, and spring with the rapidity of an arrow, seldom missing their prize, which is caught by their hands.' When they leap, they always seize with their hands the branch on which they intend to rest. They make nests of grass and leaves for their young in the branches of trees. They are a favourite article of food in Senegal.



Galago Monoli (from Routledge's *Natural History*).

GALA'NGALE (*Alpinia*), a genus of plants of the natural order *Zingiberaceæ* or *Scitamineæ*, having perennial stems with terminal inflorescence and succulent fruit. The root-stocks possess stimulating properties similar to those of ginger. The true G. is the produce of *A. galanga*, a native of the Eastern Archipelago, and cultivated there; having a stem six or seven feet high, broad leaves, and a branched panicle of greenish-white flowers. The root-stock, when young, yields a kind of arrow-root, and is used as an article of food; it acquires pungency and aromatic properties as it becomes older. G. is much used in the East for the same purposes as ginger; it is also used to a very considerable extent on the continent of Europe, but very little in Britain. Inferior kinds are obtained from several species of *Alpinia;* and from a plant of an allied genus, *Kaempferia Galanga*, the root-stock of which is commonly sold in the bazaars of Northern India.

GALA'NTHUS. See SNOW-DROP.

GALAPA'GOS ISLANDS (so named from *galápago*, the Spanish word for *tortoise*) are a volcanic group in the Pacific, situated on or near the equator, and in long. between 89° and 92° W. They are thirteen in number, the largest measuring 60 miles by 15, with an elevation of 4000 feet. They can hardly be said to be peopled, being visited chiefly for their turtles, which are of enormous size. The ten principal members of the cluster are Albemarle, Indefatigable, Chatham, Charles, James, Narborough, Hood, Barrington, Bindloes, and Abingdon.

GALASHIE'LS, a flourishing manufacturing town, and burgh of barony, of Scotland, is situated on both banks of the Gala, about one mile from its junction with the Tweed, and is partly in Selkirkshire and partly in Roxburghshire. It is 32 miles south from Edinburgh by road, and 33½ by railway. The town is of comparatively modern erection, the greater part of it having been built within the last 20 years. The superior of the barony is Hugh Scott of Gala. The government of the town is under the Police Act of 13 and 14 Vict. cap. 23, and for all purposes of the act the burgh is held to be wholly in Selkirkshire. The town is generally well built, particularly the modern houses in the suburbs, and the new factories; but it is unhappily much crowded. The staple trade is the manufacture of woollen goods, known as 'tweeds' and plaidings. A few shawls are still occasionally made. There are 16 woollen factories, all of which, with the exception of two, are driven either by steam or steam and water-power combined. The total number of 'sets of machines' in these is 60, which turn out goods annually to the value of £300,000. Pop. within the burgh in 1861, 6500. G. has a flourishing grain market, held every Tuesday. The mills employ upwards of 2200 hands.

GALATA, a suburb of Constantinople (q. v.).

GALA'TIA was in ancient times the name of a country of Asia Minor, and was so called from a body of Gauls who settled there. In the 3d c. B.C., great hordes of Gauls, under Brennus, invaded Greece. Some of them took possession of Byzantium and the Propontis, passed the Hellespont on the invitation of Nicomedes, king of Bithynia, in the year 278 B. C., subdued Troas and the north of Phrygia, and were first checked by Attalus, king of Pergamus, in a great battle about the year 239 B. C., and compelled by him to settle permanently within certain limits. The state of G., which hitherto had had no accurately defined boundaries, was now confined between Paphlagonia, Pontus, Cappadocia, Lycaonia, Phrygia, and Bithynia. It was also called Gallogræcia, and was peopled by numbers of Phrygians, Greeks, and Paphlagonians, as well as Gauls or Celts. The form of government was at first purely aristocratic, but at a later period the twelve tetrarchs who shared the government among them, in conjunction with a senate of 300 members, succeeded in making their dignity hereditary. At length one of them (30 B. C.), supported by Pompey, assumed the title of king. After his death, the kingdom descended to Amyntas, but was shortly after conquered by the Romans, and converted into a Roman province, divided under Theodosius into *Galatia prima*, with the capital Ancyra, and *Galatia secunda*, with the capital Pessinus. The majority of the Gauls of G. retained their old Celtic language as late as the time of Jerome (4th c.), who says that they spoke the same dialect as the people about Treves; and as Jerome had himself lived there, and was a good scholar, he may be regarded as an authority on the subject. G. was twice visited by the Apostle Paul.

GALA'TIANS, EPISTLE TO THE. This epistle was written by the Apostle Paul during his residence at Ephesus, probably about the year 56 A. D., and is generally reckoned the third or fourth of the Pauline epistles in the order of time. The circumstance which called it forth was the diffusion, throughout the Galatian churches, of Judaistic practices and notions, chief among which stood the famous rite of circumcision, regarded by Paul as the symbol of all that was exclusive, external, merely *ethnical*, and therefore thoroughly antagonistic to the universality of the gospel. Paul had himself been the first to preach Christ in this region, and as the majority of his converts were Gentiles, it would naturally vex him all the more keenly to see them lapsing into practices inconsistent with their new faith, and for which they had not even the excuse that might have been proffered for the Jews, viz., that antiquity had made such customs venerable. It would also appear that the Judaising adversaries of Paul had been circulating injurious reports concerning himself, hinting that he was no divinely appointed apostle, but at best a mere messenger of the church of Jerusalem, that he had quarrelled with Peter, the great apostle of the circumcision, and that he could play 'fast and loose' on this very question of circumcision itself. In his reply to the underhand attacks of his calumniators, Paul asserts the truth of his gospel, passionately declaring that he would pronounce a curse on the very angels from heaven, if they would dare to preach another, vindicates his apostleship, and gives the true version of the story of his variance with Peter. He then proceeds to discuss the relation of Judaism to Christianity, and closes with a series of exhortations and admonitions, the first of which is the well-known 'Stand fast therefore in the liberty wherewith Christ hath made us free, and be not entangled again with the yoke of bondage' (v. 1). The commentaries on Galatians are very numerous; among others may be mentioned those of Luther, Winer, Rückert, De Wette, Meyer, Ellicott, and Alford.

GALATI'NA, S. Pietro in Galatina, a town in the south of Italy, in the province of Otranto, is situated in a fertile but unhealthy plain, 13 miles south of the town of Lecce. Some maintain that it is a very ancient place, but there seems no historical ground for the assertion. G. is a thriving commercial town, and possesses fine public edifices and handsome churches. Pop. 8400. Raimondo Orsino, Prince of Taranto, and Lord of Galatina, surrounded the town with ramparts, as a tribute to the citizens for having ransomed him from the Turks for 12,000 ducats.

GALATO'NE, a very ancient town in the south of Italy, in the province of Otranto, about nine miles north-east of Gallipoli, is situated in a very rich but insalubrious plain. Pop. 5500. In the struggle between Joanna Queen of Naples and Alfonso, G., having declared for the former, was besieged by Alfonso, and its ramparts destroyed. It has been possessed by several illustrious families.

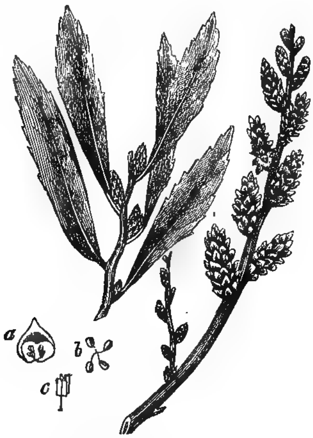
GA'LAXY, The (Gr. *gala*, *galaktos*, milk), or the Milky-Way, is the great luminous band which nightly stretches across the heavens from horizon to horizon, and which is found, when carefully traced, to form a zone, completely encircling the whole sphere almost in a great circle. At one part of its course, it opens up into two branches, one faint and interrupted, the other bright and continuous, which do not reunite till after remaining distinct for about 150°. This great zone has occupied the same position in the heavens since the earliest ages. The reader will find its course mapped out on any celestial globe, and a verbal account of it in Sir John Herschel's *Outlines of Astronomy*, by which he may test the accuracy of the chart. That course, as traced by the naked eye, following the line of its greatest brightness, conforms nearly to that of a great circle, called the Galactic Circle, inclined at an angle of about 63° to the equinoctial, and cutting that circle in 0 hours 47 minutes, and 12 hours 47 minutes right ascension. Throughout the space where, as above stated, it is divided into two branches, this great circle is intermediate to the two, lying nearer that which is the brighter and more continuous. The most casual survey of the Galaxy shews that it is wanting in regularity of outline. Besides the two great branches into which it divides, it has many smaller ones which spring out from it. At one point, it diffuses itself very broadly, and opens out into a fan-like expanse of interlacing branches nearly 20° in breadth. At the same point the branches terminating abruptly, a wide gap presents itself in the zone, on the opposite side of which it recommences its course with a similar assemblage of branches. At other points, its course is described by Sir John Herschel as 'irregular, patchy, and winding;' while at more than one point, in the midst of its brightest parts, broad dark spaces occur. One of these, known from early times among navigators as the 'coal-sack,' is a singular pear-shaped vacancy of about 8° in length, and 5° broad, occurring in the centre of a bright area overlying portions of the constellations of the Cross and Centaur. The 'coal-sack' occupies about half the breadth of this bright space, and presents only one star visible to the naked eye, though it contains many telescopic stars. Its blackness, which attracts the most superficial observer, is thus due to the contrast with the brilliant ground by which it is surrounded.

The Galaxy was examined by Sir William Herschel with his powerful telescope, and found to be composed entirely of stars. How a collection of stars can assume such appearances as are presented in the Galaxy, is explained in the article Stars (q. v.).

GALBA, Servius Sulpicius, Roman emperor from June 68 A.D. to January 69, was born 24th December 3 B.C., of a respectable family. He was raised to the consulship in 33 A.D.; and in the administration of the province of Aquitania under Tiberius, of Germany under Caligula, of Africa under Claudius, and of Hispania Tarraconensis under Nero, he distinguished himself for bravery, strictness, and justice. His friends had urged him, on the death of Caligula, to take possession of the throne, but he continued faithful to Claudius, and therefore stood high in his favour. In 68, Julius Vindex rose with the Gallic legions against Nero, and called on G. to assume the imperial dignity, and thus rid the earth of its oppressor. G., who had been informed that Nero was contriving his death, came forward against him at first as the legate of the Roman people, and it was only when he heard of Nero's death that he proceeded to Rome to take possession of the throne offered him by the Prætorians. G. was now upwards of 70 years old, and it soon appeared that his character had deteriorated, as, indeed, had already been manifested in his later administrations. Indulgence to greedy favourites, ill-timed severity, above all, avarice, which led him to withhold the usual donatives to the troops, made him unpopular. The legions in Upper Germany called on the Prætorians to choose another emperor; G. thought to soothe them by adopting Piso as his coadjutor and successor; but he thus offended Otho, who, as administrator of Lusitania, had supported G., and looked to be rewarded. The Prætorians, who had received no donative on occasion of Piso's adoption, were easily excited to insurrection by Otho, and the emperor having gone out to quell the rebellion, was cut down by the soldiers as he crossed the forum.

GA'LBANUM, a gum resin used in medicine in the same cases as assafœtida. It is principally employed in chronic catarrh, and has been given (especially by the Germans) in amenorrhœa and chronic rheumatism. It is generally administered in the form of the *compound galbanum pill*, which contains galbanum, sagapenum, assafœtida, myrrh, and soft soap. It is sometimes applied externally in plasters as a mild stimulant in indolent swellings. It is brought from the Levant, and appears in commerce either in tears or in large masses. It is soft, ductile, whitish, or, when long kept, yellowish in colour; has a peculiar balsamic odour, and an acrid, bitter taste. Although it has been known from the earliest ages, and is mentioned by Moses (Exod. xxx. 34) under the name *chelbenah* (translated galbanum in the English Bible), it is still uncertain from what plant it is derived. *Galbanum officinale*, *Ferula galbanifera*, and *Opoidia galbanifera*, all of the natural order *Umbelliferæ*, have, on various grounds, been supposed to be the source of galbanum; and the confidence with which they have been so represented has perhaps prevented travellers from making that inquiry into the subject which otherwise they might have made. It is highly probable that galbanum is the produce of an umbelliferous plant. *Bubon Galbanum*, a plant of this order, found at the Cape of Good Hope, yields a gum resin very similar to galbanum.

GALE, or **SWEET GALE** (*Myrica gale*), a small shrub of the same genus with the North American Candleberry (q. v.), and very nearly allied to it—a native of all the northern parts of the world, growing in bogs and in moist gravelly soils, very abundant in some parts of Britain, but very local. It has small lanceolate slightly serrated leaves, which are sprinkled with resinous dots, and emit a most agreeable fragrance. Its berries are small, and sprinkled with golden resinous dots. The northern nations formerly used this plant instead of hops. The leaves were also employed as a remedy for itch, and have the power of keeping away moths. A decoction of them is efficacious against bugs. By distillation they yield a yellow essential oil. In the Highlands of Scotland, beds are often made of the twigs of gale, which is there called *nodh*.



Gale (*Myrica gale*):
a, a scale of the catkin, inside; *b*, stamens; *c*, an anther.

GALEN, Christoph Bernhard von, Bishop of Münster, and one of the greatest generals of his time, was born at Bispink, in Westphalia, 15th October 1600. After completing his studies in the Jesuit college of Münster, and at the universities of Cologne, Mayence, Louvain, and Bordeaux, he held several political offices, and was at last made Bishop of Münster, 14th November 1650. The vigour of his administration immediately began to appear in restoring church-discipline, in allaying a famine which prevailed at the time, in promoting trade, and ridding the country of foreign troops. He soon, however, fell into disagreements with the inhabitants of Münster, who, on applying to Holland, received 25,000 guilders to assist them against him; but with the support of 1200 cavalry from the emperor, the bishop reduced the town into submission in 1660, and continued to maintain his ascendency by severe measures. In 1664, on being appointed, along with the Markgraf of Baden, director of the military affairs of the Rhenish alliance, he proceeded with most of his own troops to the seat of the war against the Turks. After his return, he entered into alliance with England against the Netherlands, but the war was soon concluded, in consequence of the treaty brought about by Louis XIV. in 1666, according to which the States-general promised the restoration to the bishop of all his lands. A dispute, however, afterwards arose, and in 1672, G. again went to war with the Dutch in alliance with France. After some successes obtained in union with Turenne, he suffered such a heavy loss during the siege of Coevorden, by a storm which placed his camp under water, that he willingly concluded a treaty with the allies in 1674, in which he promised to give up all his conquests in the Netherlands. In the following year, he changed sides, and entered into alliance with the emperor against the French. By taking part, also, with the king of Denmark and the elector of Brandenburg in the war with Sweden, he added the duchy of Bremen and other places to his possessions. In 1678, he obtained considerable pecuniary compensation for being drawn into war with East Friesland; but while the peace negotiations were going on he died, 19th September. The family of G. is one of the oldest in Westphalia, and is at present represented by Count Matthias von Galen, whose brother, Count Ferdinand, has distinguished himself in the Prussian service as an able diplomatist.

GALE'NA, or **LEAD-GLANCE**, a mineral which is essentially a sulphuret of lead, the proportions being 13·3 sulphur and 86·7 lead; but usually containing a little silver, and sometimes copper, zinc, antimony, or selenium. It is of a lead-gray colour, with a metallic lustre, is found massive, or sometimes granular, or crystallised in cubes or octahedrons. It is very easily broken, and its fragments are cubical. It occurs in veins, beds, and imbedded masses, often accompanying other metallic ores, in primitive and secondary rocks, but most of all in what is known as transition or mountain limestone. It is found very abundantly in some parts of Britain. Almost all the lead of commerce is obtained from it. It sometimes contains so much silver, that the separation of that metal is profitably carried on. The lead is extracted from it by a very simple process. See Lead.

GALENA, a thriving city of the United States, North America, is situated in the north-west corner of the state of Illinois, on both sides of the Galena river, and three miles from the junction of that stream with the Mississippi. It is 450 miles north of St Louis, and 250 miles north-north-west of Springfield. The city, owing to the irregularity of the ground on which it is built, has a bold and picturesque appearance. In and around the town, high bluffs, rising frequently to a height of more than 200 feet, everywhere occur. The streets rise in terraces, one above another, communicating by flights of steps; and among the public buildings are numerous churches and schools, a United States marine hospital, and a custom-house. G. owes its origin and rapid growth to the rich mines of lead which surround it. In 1857, 34,183,250 lbs. of lead, valued at 801,324 dollars, were exported from Galena. Copper is also found, though not in great quantity. G. has manufactures of pottery, soap, and candles; it has also lead furnaces, iron foundries, and machine-shops; breweries, carriage-manufactories, and numerous mills. Besides lead, it exports horses, cattle, pork, and agricultural produce. In 1819 the first house was built at G.; in 1859 it contained 14,000 inhabitants.

GALE'NICAL, GA'LENIST, two words having reference to the controversies of the period of the revival of letters, when the authority of Galen was strongly asserted against all innovations, and particularly against the introduction of chemical, or rather *alchemical* ideas and methods of treatment into medicine. The Galenists adhered to the ancient formulas, in which drugs were prescribed, either in substance or in the form of tinctures and extracts, &c.; while the chemists professed to extract from them the essences, or quintessences (*quinta essentia*, the *fifth* essence, supposed to be particularly pure, as requiring five processes to extract it), i. e., substances in small bulk, presumed to contain the whole virtues of the original drugs in a state of extreme concentration, or purified from all gross and pernicious, or superfluous matter. There can be no doubt, now-a-days, that upon both sides of this controversy there was a great deal of blind error and rash dogmatism, which on the side of the chemists, as in Paracelsus, took the form of quackery and mysticism; while the Galenists, on the other hand, were the supporters of tradition and all its encumbrances, and too often the envenomed partisans of old blunders or misconceptions, as opposed to new forms of truth. But the original idea of those who afterwards became identified with the sect of the Galenists, was rather to free the ancient medicine from the irrational dogmas and methods of cure with which it had been overlaid by the Arabians and the monks, than to insist upon mere antiquity, or upon Galen's authority in particular, as demanding the blind assent of mankind in opposition to new truth. Now that chemistry has really given us new methods of preparing drugs, which supersede many of those that have been used from time immemorial, it is still customary with some to call preparations by the latter methods *Galenical*, as contrasted with the crystalline alkaloids, or the perfectly pure acids and bases, which contain the virtues of most of our most valuable vegetable medicines. See Galen, Paracelsus, Alchemy, and the several articles on the materia medica.

GALE'NUS, Claudius, commonly called Galen, a very celebrated physician, born at Pergamus, in Mysia, 130 A.D. In his 17th year, his father, Nicon, who had hitherto destined him to be a philosopher, in consequence of a dream, chose for him the profession of medicine. This subject he first studied at Pergamus, afterwards at Smyrna, Corinth, and Alexandria. He returned to his native city in his 29th year, and was at once appointed physician to the school of gladiators. In his 34th year, he went to Rome, where he stayed for about four years, and gained such a reputation, that he was offered, but declined, the post of physician to the emperor. He returned to his native country in his 38th year, and had scarcely resumed his ordinary course of life, when he received a summons from the Emperors M. Aurelius and L. Verus to attend them in the north-eastern frontier of Italy, whither they had gone to make preparations for a war with the northern tribes. He joined the camp towards the end of the year 169; but a pestilence breaking out, the emperors and their court set off for Rome, whither G. accompanied or followed them. On the return of M. Aurelius to the seat of war, G. obtained permission to be left at Rome, alleging that such was the will of Æsculapius, as revealed to him in a dream. How long G. stayed at Rome on this second occasion is not known, but we ascertain from his works that he attended M. Aurelius and his two sons, Commodus and Sextus, and that at about the end of the 2d c. he was employed to compound a celebrated medicine called Theriaca for the Emperor Severus. If the statement of one of his Arabic biographers be correct, who expressly says that G. was only twice at Rome, we must infer that the greater part of his middle and more advanced life was spent in that city. The place and date of his death are not known with certainty, but it is believed that he died in Sicily about the year 201.

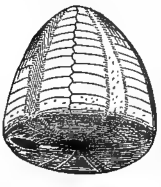
The works that are still extant under the name of G. consist, according to Choulant, in his *Handbuch der Bücherkunde für die aeltere Medicin*, of 83 treatises acknowledged to be genuine; 19 whose genuineness has been questioned; 45 undoubtedly spurious; 19 fragments; and 15 commentaries on different works of Hippocrates. Besides these, he wrote a great number of works whose titles only are preserved, and altogether it is believed that the number of his distinct treatises cannot have been less than 500.

We may divide his works into (1) those on anatomy and physiology; (2) those on dietetics and hygiène; (3) those on pathology; (4) those on diagnosis and semeiology; (5) those on pharmacy and materia medica; (6) those on therapeutics, including surgery; (7) his commentaries on Hippocrates; and (8) his philosophical and miscellaneous works. We have most of these works in Greek, the language in which they were originally written; some are, however, preserved only in Latin translations, and a few only in Arabic. His most important anatomical and physiological works are —*De Anatomicis Administrationibus*, and *De Usu Partium Corporis Humani*. Of the latter, Dr Greenhill (Smith's *Dictionary of Greek and Roman Biography*) remarks that 'it is no less admirable for the deep religious feeling with which it is written, than for the scientific knowledge and acuteness displayed in it.' For a good general account of G.'s anatomical and physiological knowledge, we may refer to a memoir published by the late Professor Kidd of Oxford in the sixth volume of *The Transactions of the Provincial Medical and Surgical Association*, entitled 'A Cursory Analysis of the Works of Galen, so far as they relate to Anatomy and Physiology,' and Daremberg's *Exposition des Connaissances de Galien sur l'Anatomie, la Physiologie, et la Pathologie du Système Nerveux* (Paris, 1841), may also be consulted with advantage. His anatomical and physiological writings are by far the most valuable of his works. They contain undoubted evidence of his familiarity with practical anatomy; but whether he derived his knowledge from dissections of human bodies or those of the lower animals, is uncertain. The latter is the most probable view —(1) because he frequently recommends the dissection of apes, bears, goats, &c.; and (2) because he mentions, as something extraordinary, that those physicians who attended the Emperor M. Aurelius in his wars against the Germans had an opportunity of dissecting the bodies of the barbarians. Much curious information regarding G.'s views on dietetics and hygiène will be found in Adams's *Commentary on the First Book of Paulus Ægineta*. His pathology was very speculative and imperfect. In his diagnosis and prognosis, he laid great stress on the pulse, on which subject he may be considered as the first and greatest authority, for all subsequent writers adopted his system without alteration. He likewise placed great confidence in the doctrine of critical days, which he believed to be influenced by the moon. In materia medica, his authority was not so high as that of Dioscorides. Numerous ingredients, many of which were probably inert, enter into most of his prescriptions. He seems to place a more implicit faith in amulets than in medicine, and he is supposed by Cullen to be the author of the anodyne necklace, which was so long famous in England. We cannot attempt to enter into his system of therapeutics. We may, however, observe, that his practice is based on two fundamental principles—(1) that disease is something contrary to nature, and is to be overcome by that which is contrary to the disease itself; and (2) that nature is to be preserved by that which has relation to nature. Hence arise two general indications of treatment—the one taken from the affection contrary to nature, which affection requires to be overcome; the other from the strength and natural constitution of the body, which requires to be preserved.

Before G.'s time, the medical profession was divided into several sects, who were always disputing with one another; as, for example, the Dogmatici, Empirici, Eclectici, Pneumatici, and Episynthetici. After his time, all these sects seem to have merged in his followers. The subsequent Greek and Roman medical writers were mere compilers from his writings; and as soon as his works were translated (in the 9th c.) into Arabic, they were at once adopted throughout the East, to the exclusion of all others. In short, G. reigned paramount throughout the civilised world till within the last 300 years. The records of the London College of Physicians afford a striking illustration of this fact, in so far as England is concerned. In 1559, Dr Geynes 'was cited before the college for impugning the infallibility of Galen. On his acknowledgment of his error and humble recantation, signed with his own hand, he was received into the college.'

The Greek text has been published four times. The first edition was the Aldine, printed in 1525, in 5 folio volumes; the latest and most accessible edition is that of C. G. Kühn, in 20 octavo volumes, the publication of which extended from 1821 to 1833. A good critical edition is still required.

GA'LERITES (*galerus*, a cap), a genus of fossil sea-urchins, peculiar to and abundant in the Chalk measures. The generic name, as well as that popularly given to them in the districts where they abound, viz., 'Sugar-loaves,' is descriptive of the elongated and more or less conical shape of their shell. The body in breadth is nearly circular or polygonal. The under surface is entirely flat, and has the mouth placed in its centre, with the vent near the margin. There are five avenues of pores reaching from the mouth to the summit. These fossils are often found silicified. The species figured is one of the most abundant; it has received its specific name from its resemblance to the white caps worn by the priests of Jupiter.



Galerites Albogalerus.

GALE'RIUS, Valerius Maximianus, a Roman emperor of humble parentage, was born near Sardica, in Dacia, entered the imperial army, and rose from one grade of military rank to another, until Diocletian conferred on him, along with Constantius Chlorus, the title of Cæsar (292 A.D.), and gave him his daughter in marriage. On the abdication of Diocletian (305 A.D.), he and Constantius became *Augusti*, or joint-rulers of the Roman empire. On the death of Constantius at York (306 A.D.), the troops in Britain and Gaul immediately declared their allegiance to his son, Constantine (afterwards Constantine the Great), much to the chagrin of G., who expected the entire sovereignty of Rome to fall into his hands. He died in 311 A.D. G. was a brave soldier and a skilful commander, but appears to possess no other claims to the respect of posterity. He hated the Christians 'with a perfect hatred;' and it is believed that it was he who forced Diocletian to issue his famous edict against them, which caused the *last* of the imperial persecutions. His mother, an ignorant pagan fanatic, is said to have exercised much influence over him; but it is highly probable that his treatment of the adherents to the Christian faith was also determined by a politic opposition to Constantius and his son, who tolerated, and even respected the new opinions and practices.

GALIA'NI, Ferdinando, an Italian savant, was born in Chieti, a province of the Abruzzi, in 1728, and exhibited at an early period an extraordinary aptitude for learning. Philosophy, history, archæology, and more especially the science of political economy, were his favourite studies; but, nevertheless, he first attracted notice by a clever squib on the death of the public executioner. This consisted of a collection of essays eulogistic of the deceased, in which the style of the president and leading members of the Neapolitan Academy was admirably imitated. It was entitled, *A Collection of Papers in honour of Domenico Jannacone, Public Executioner, revised and issued by the President of the Academy, Gian Antonio Sergio, Advocate*, and excited universal comment in Naples. The young delinquent was condemned to a period of seclusion, prescribed for penitential exercises. His next publication, *Della Moneta*, was more deserving of his pen, and evinced his great learning and powers of reflection. It must be regarded as a valuable contribution to the science of political economy. The leading principle which it seeks to establish is, that coin is a merchandise, and that its value and interest ought to be left free like other goods. By the adoption of the sage monetary doctrines propounded by an economist, who barely numbered 20 years, the financial ruin of Naples is said to have been then averted. In 1751, he visited the chief cities of Italy, and was everywhere honourably received. From Pope Benedict XIV. he received repeated proofs of favour and confidence. Having contracted during his travels intimate friendships with some of the most famous naturalists of his country, he immediately entered with enthusiasm into their pursuits, and on his return to Naples collected a rich assortment of the stones and volcanic matter of Vesuvius, which he subsequently presented to the pope, accompanied by a learned thesis. On one of the stone specimens, he engraved the following suggestive inscription, '*Beatissime pater, fac ut lapides isti panes fiant;*' and received, by way of answer, the rich prebend of Amalfi, for which he had previously qualified himself by entering into holy orders. In 1759, he became secretary to the Neapolitan Embassy at Paris, where his wit, vivacity, and learning made him a universal favourite. In 1767, he visited England, whose social and political institutions he studied deeply. On his return to Paris, he wrote another treatise on political economy, entitled *Dialoghi sul Commercio del Grano* (Dialogues upon the Trade in Corn), in which he argues against both the extreme protectionists and the pure free-traders. Being recalled to Naples, he was successively appointed to various posts of trust and importance. He died at Naples in 1787, leaving behind him rare collections of musical MSS., ancient coins, sculptures, medals, precious stones, cameos, &c.

GALI'CIA, formerly a province in the north-west of Spain, with an area of 11,195 square miles, and a population of about 1,776,879 souls, has been divided, since 1833, into the minor provinces of Coruña, Lugo, Orense, and Pontevedra. The country is mountainous, being covered by several offsets of the Asturian chain, rising in their highest peaks to the height of about 6000 feet. Capes Ortegal and Finisterre project into the Atlantic. The numerous rivers form *Rias*, or small estuaries at their mouths, and afford secure havens and roads. The principal river is the Minho, which, with its feeders, the Sil and the Avia, is navigable as it approaches the sea. G. is one of the most fruitful portions of Europe, and has a mild nourishing climate. Rich meadows and dense forests occur everywhere, but the soil is more suited to the cultivation of garden-produce than of corn. The inhabitants, who are called Gallegos, are a robust, vigorous, and industrious race. They visit various parts of the country, and are employed in Madrid as water-carriers, porters, &c. Fishing and navigation are the occupations most largely followed. Linen manufactures have been recently established. The principal towns are St Jago di Compostella, and the two strongly fortified seaports Coruña and Ferrol.

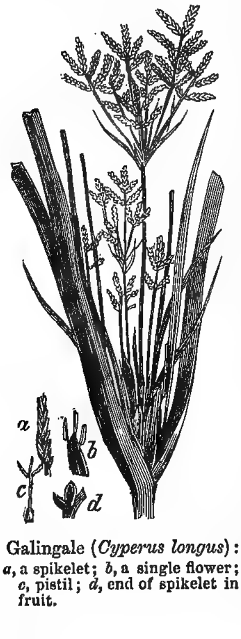
GALICIA, a crown-land belonging to the Austrian monarchy, including the former kingdoms of Galicia and Lodomeria, the duchies of Auschwitz and Zator, and the grand-duchy of Cracow. It is bounded on the N. by Poland and Russia, on the E. by Russia, on the S. by the Bukowina and Hungary, and on the W. by Silesia. It has an area of 29,941 square miles, and its population in 1857 amounted to 4,597,470, the great body of whom are Roman Catholics. The country is a high terrace, situated at the northern base of the Carpathians. The northern portion forms an extensive plain, broken only by low ranges of hills. There are many large rivers—those in the west being feeders of the Vistula, those in the east, of the Danube and Dniester. The climate of G. is colder than that of any other portion of the Austrian empire; the soil, with the exception of some sandy and marshy districts, is fertile, and produces corn, which is exported in considerable quantities. Flax, hemp, tobacco, hops, &c., are likewise cultivated. Horses, cattle, and sheep are raised in considerable numbers. Wolves and bears are still found in the mountainous districts. Salt is the most important mineral. Industry has lately made marked progress. Commerce is on the increase. The roads are good; and a railway has been recently constructed. For administrative purposes, G. has been divided into three governments—viz., Lemberg, Cracow, and Stanislawow. G. takes its name from the old fortress and town of Halicz, on the Dniester. The original Slavonic inhabitants, the Ruthenes, were, towards the end of the 9th c., conquered by the Russians of Kiew. The western portion of the country had already become dependent on Poland, and afterwards on Hungary. In 1382 it was restored to Poland, and continued to belong to that country till the partition of 1773, when G. became one of the crown-lands of Austria. In 1846, Cracow, with the territory belonging to it, was, by a treaty of the three powers (Austria, Russia, and Prussia), given up to the emperor of Austria, and by him annexed to the crown-land of Galicia.

GALICZ. See Halicz.

GA'LILEE, the name applied to a porch or chapel placed at the entrance to a church, beyond which women were not permitted to pass. In abbeys, for example, the monks came to the galilee to see their female relatives. A portion of the nave was sometimes marked off by a step, or, as at Durham, by a line of blue marble, to mark the boundary to which women were limited. There are fine specimens of galilees at Lincoln, Ely, and Durham.

GALILEE (Heb. *Galil*, a 'circle' or 'circuit') is the name originally applied to a small district belonging to the Jewish tribe of Naphtali (see Josh. xx. 7). Here were situated the 20 towns which Solomon gave to Hiram, king of Tyre, for his assistance in building the temple. Phœnician colonies, in consequence, appear to have established themselves here, or the towns perhaps reverted by some chance to their original Canaanitish occupants, for at a later period we find Isaiah (ix. 1) speaking of the district as 'Galilee of the nations.' These 'nations,' or Gentiles, appear to have greatly increased in numbers, and to have finally spread themselves over all the surrounding country, until, in the time of our Lord, the name 'Galilee' embraced the whole northern portion of Palestine from the Mediterranean to the Jordan. As early as the time of the Maccabees (book I. chap. v. verses 20—23), the number of Jews in G. was very small; Strabo, a contemporary of Christ, states that in his day it was mainly inhabited by Syrians, Phœnicians, and Arabs, to whom Josephus adds Greeks. The principal towns at the dawn of Christianity were Tiberias, Tarichæa, and Sepphoris; those that figure in the gospels are Cana, Capernaum, Nazareth, and Nain. The Jewish inhabitants of G. spoke a broader and coarser dialect than their southern brethren of Judæa, and were held in low estimation by the latter, partly on account of their more liberal sentiments in regard to religion. It has been thought likely that this liberality, the existence of which is indisputable, was owing to their intercourse with their different heathen neighbours. Every one of the disciples was a Galilean either by birth or residence, and consequently may not have been a *Jew* at all in the strict sense of the term; i. e., in being able to boast of having 'Abraham for his father.' The first three gospels are chiefly taken up with records of the Saviour's ministrations in this province. After the destruction of Jerusalem, the despised G., as if retributively, became the refuge of the proud doctors of Jewish law, and the city of Tiberias the seat of Rabbinical learning. The ruins of many fine synagogues are still extant in the old towns and villages of this region. At present, G. belongs to the pashalic of Damascus, in the Turkish province of Syria or Soristan, and, as of yore, is remarkable for its beauty and fertility. It still has a considerable number of Jewish inhabitants.

GALILEI, Galileo, the creator of experimental science, was born at Pisa on the 15th of February 1564. He belonged to a Florentine family more ancient than opulent. G., by desire of his father, exclusively directed his early studies to medicine, and the prevailing Aristotelian philosophy, the dogmas of which he soon ventured to disbelieve and despise. At the age of eighteen he made one of his most important discoveries. Happening on one occasion to observe, in the cathedral of Pisa, the oscillation of a lamp casually set in motion, G. was struck with the apparent measured regularity of its vibrations; and having tested the correctness of this observation by comparing the beat of his own pulse with the action of the pendulum, he concluded that by means of this equality of oscillation a simple pendulum (q. v.) might become an invaluable agent in the exact measurement of time. This discovery he subsequently utilised by the successful application of the pendulum in constructing a clock for astronomical purposes. G.'s irrepressible bias towards mechanical constructions and experimental science received a new impulse from his intercourse with a friend of his father's, Ostilio Riccio, professor of mathematics, who, in compliance with the youth's entreaties, initiated him into the principles of mathematics. Such was G.'s absorption and delight in his new studies, that his father at length sanctioned his abandonment of the art of medicine, in order that he might concentrate his powers on his chosen sciences. The first fruit of his geometrical investigations was the invention of a hydrostatic balance, by which the specific gravity of solid bodies might be ascertained with the nicest accuracy. In 1589, the fame of G.'s extraordinary learning having reached the Grand Duke of Tuscany, this enlightened prince appointed him professor of mathematics in the university of Pisa, where he covertly inculcated many of those great innovations in physical science which have since added such lustre to his memory. About this period he turned his attention to the then very imperfectly comprehended laws of bodies in motion; and in opposition to all received systems, he propounded the novel theorem, that all falling bodies, great or small, descend with equal velocity. This soon led him to the discovery of 'the *three* laws of motion,' and the law regulating the motion of falling bodies, which is expressed by the formula $S = \frac{1}{2} ft^2$. This theory of falling bodies was proved correct by several experiments which were made from the summit of the leaning tower of Pisa, greatly to the chagrin of the Aristotelians, whose enmity to G. now grew more decided. In consequence, he deemed it prudent to relinquish his chair at Pisa, and retired to Padua, where he accepted the offer of the Venetian senate to lecture on mathematics in the university for the space of six years. It is also said, however, that G. lost his chair at Pisa, from having ridiculed the mechanical pretensions of John de Medici, son of Cosmo I. G.'s engagement at Padua was eventually prolonged to the term of 18 years; but so urgent was his desire to return to his birthplace, that he sought a restoration to his former post at Pisa, and was gratified by an assent being eagerly accorded by Cosmo de' Medici, with exemption from any but a voluntary exercise of the duties of the professorship. During his sojourn at Padua, his course of lectures enjoyed extraordinary popularity; crowds of pupils flocked to hear him from all parts of Europe; and he was the first to adapt the Italian idiom to philosophical instruction. Among the various and noble discoveries with which he enriched science, may be noticed a species of thermometer, a proportional compass or sector, and more important than all, the construction of the refracting telescope for astronomical investigation. In 1609, he offered his first complete telescope to the Doge of Venice, Leonardi Deodati, by whom it was tested from the tower of St Mark with equal surprise and delight. In the same year he constructed a microscope; and then this indefatigable interpreter of the mysteries of nature commenced his astronomical researches by means of his own telescope. He speedily concluded that the moon, instead of being a self-luminous and perfectly smooth sphere, owed her illumination to reflection, and presented an unequal surface, deeply furrowed by valleys and mountains of great extent. The Milky Way he pronounced a track of countless separate stars; and these discoveries were crowned by a still more important series of observations, which led to the discovery of the four satellites of Jupiter on the night of the 7th of January 1610 (though it was not till the 13th of the same month that he came to the conclusion that they were satellites, and not fixed stars), which he named the Medicean stars, in honour of his constant protectors in that family. He also was the first to note movable spots on the disc of the sun, from which he inferred the rotation of that orb. Encircled by the lustre of these sublime discoveries, he departed from Padua, and returned to Tuscany in 1610, where renewed quarrels with the Aristotelians disquieted and embittered his existence. In 1611, he visited Rome, and was received with great distinction, being enrolled a member of the Lincei Academy; but four years later, on repeating the visit, his reception was widely different, as by that time in his work on the solar spots he had openly advocated the Copernican system, and was in consequence denounced as a propounder of heretical views. He repaired again to Rome, to demand an experimental inquiry into the soundness of his views; but the grand duke apprehending inquisitorial dangers for his favourite, summoned him back to Tuscany; at the same time the pope, through the famous Cardinal Bellarmine (a sincere friend of G.'s), commanded him to abstain from all future advocacy of his heretical doctrines. Some time after, he wrote his most famous work in the form of a dialogue between three fictitious interlocutors, the one in favour of the Copernican system, the second an advocate of the Ptolemaic, and the third a rabid supporter of the Aristotelian school. Of course, the whole weight of the *proof* falls into the Copernican scale; and nothing can exceed the classic beauty of this composition, or the compactness of the chain of its argument. In 1630, G. contrived to obtain the papal imprimatur, which was subsequently revoked; but having got a similar authorisation at Florence, he published, in 1632, this exponent of his opinions under the title of *Un Dialogo intorno i due Massimi Sistemi del Mondo*. Hardly had the work been issued, when it was given over to the jurisdiction of the Inquisition. Pope Urban, previously Cardinal Barberini, and, until now, a friend and eulogist of G., was led to believe that G. had satirised him in this work under the title of *Simplicio*, as one who is careless about scientific truth, and who timidly adheres to the saws of antiquity. He resolved to punish the audacious philosopher. In spite of his 70 years and heavy infirmities, G. was summoned before the Inquisition to answer for his heresies. After a wearisome trial and incarceration, his judges condemned G. to abjure by oath on his knees the sublime truths of his scientific creed. This he was weak enough to do. His latest biographer, M. Philarète Chasles, however, denies that G. was put to the torture, and pronounces the letter of G. to Reinecci, from which Tiraboschi quotes to prove it, a forgery. His famous whisper, *E pur si muove* ('But nevertheless it does move'), is also in danger of being regarded as a fiction. G. was sentenced to an indefinite term of imprisonment in the Inquisition, which was soon commuted by Pope Urban, at the request of Ferdinand the Grand, Duke of Tuscany, into permission to reside at Siena, and finally at Florence, should the prisoner's health require the change. In his retreat at Arcetri, he continued with unflagging ardour his learned researches, even when hearing grew enfeebled and sight was extinguished. He died on the 8th of January 1642, at the age of 78, and was interred by ducal orders in the cathedral of Santa Croce, where a majestic monument symbolises his great achievements. His disposition was truly genial; he enjoyed with keenness the social wit and banter of his chosen friends, and the generous pleasures of the banquet; and the readiness with which he offered or accepted atonement, modified a somewhat irascible disposition. The great deficiencies in his character were a want of tact to keep out of difficulties, and a want of moral courage to defend himself when involved in them. His biting satirical turn, more than his physical discoveries, was the cause of his misfortunes. The dignitaries of the church who persecuted G., warned him beforehand in the friendliest way to be 'more prudent.' Their conduct in persecuting opinion, or rather, in G.'s case, *demonstrated fact*, is of course utterly inexcusable; but that is no reason why we should run to the other extreme, and declare G. to be a martyr. No great man had ever less claim to the title. It is also right to add, that the congregation of the Inquisition by which G. was condemned, is not believed by Roman Catholics to speak with the plenary authority of the Catholic Church, nor are its decisions regarded as infallible even by the most extreme ultramontanes. G. was of small stature, but of a robust and healthy frame; his countenance was attractive, and his conversation cheerful. He loved art, and cultivated especially music and poetry. Ariosto he knew almost by heart, and appreciated keenly the beauties of this great classic. Tasso, on the other hand, he unduly depreciated, and inflicted much pain on the sensitive spirit of the poet by his severe criticism entitled *Considerazioni al Tasso*. His own style is nervous, flowing, and elegant. His collected works have been published in 13 volumes, 8vo (Milan, 1811), and at various other places. His devoted pupil, Viviani, has written a life of G.; see also Drinkwater in the *Library of Useful Knowledge;* Sir David Brewster in Lardner's *Cabinet Cyclopædia;* and M. Philarète Chasles's *Galileo Galilei: sa Vie, son Procès, et ses Contemporains, d'apres les Documents Originaux* (Paris, 1862). We may briefly recapitulate G.'s most important contributions to physical science under the following heads: 1. The relation between space and time in the case of falling bodies, also the 'three laws of motion;' 2. The path of projectiles is a parabola; 3. The isochronism of the pendulum; 4. That air has weight, also partial discovery that suction is owing to the pressure of the atmosphere; 5. The re-invention of Aristotle's theory respecting sound; 6. The invention of the telescope; 7. The discovery of the satellites of Jupiter, phases of Venus, and spots on the sun. For the nature of these discoveries, see PENDULUM, FALLING BODIES, PROJECTILES, &c.



Galingale (*Cyperus longus*): *a*, a spikelet; *b*, a single flower; *c*, pistil; *d*, end of spikelet in fruit.

GALINGALE, a name often applied to the tubers of *Cyperus longus*, and sometimes to the whole plant. See CYPERUS.

GALIPEA. See ANGOSTURA BARK.

GALIUM. See BEDSTRAW.

GALL. A synonym for bile, the secretion of the Liver (q. v.)

GALL, FRANZ JOSEPH, the founder of phrenology, was born at Tiefenbrunn, near Pforzheim, on the borders of Baden and Würtemberg, 9th March 1758. He studied medicine at Vienna, and settling there, became known as a practical physician, and by the publication of his *Philosophisch-Medicinische Untersuchungen über Natur und Kunst im gesunden und kranken Zustande des Menschen* (Vienna, 1791). But he acquired a much more extended reputation by his lectures on the structure and functions of the brain, which he began to deliver in 1796. See PHRENOLOGY. His views were so subversive of received doctrines on the subject of mind, that a spirit of opposition was excited, and the lectures were prohibited in 1802 by the Austrian government. Along with his pupil Dr Spurzheim (q. v.), who became his associate in 1804, G. quitted Vienna in 1805, and during his travels through Germany, Holland, Sweden, and Switzerland, expounded his views in many of the universities and principal cities, where he found many adherents as well as opponents. In 1807, he settled as a physician in Paris, and there began lecturing and writing for the propagation of his opinions. As a foreigner teaching science to the French, he was discountenanced by Napoleon. On 14th March 1808, he and Spurzheim presented to the Institute of France a Memoir of their discoveries, on which a committee of the members of that body (including Pinel, Portal, and Cuvier) drew up an unfavourable *Report*. Of this there is a translation in the *Edinburgh Medical and Surgical Journal* for January 1809. G. and Spurzheim thereupon published their *Memoir*, with a reply to the *Report*, in a volume entitled *Recherches sur le Système Nerveux en général, et sur celui du Cerveau en particulier; suivi d'Observations sur le Rapport*, &c. (Paris, 1809, 4to). This was followed by their larger work, *Anatomie et Physiologie du Système Nerveux*, &c. (Paris, 1810—1819, 4 vols. 4to), with an Atlas of 100 plates; but the two phrenologists having parted in 1813, the name of G. alone is prefixed to vols. 3 and 4; and it alone is borne by a reprint of the physiological portion of the work, entitled *Sur les Fonctions du Cerveau, et sur celles de chacune de ses Parties* (Paris, 1825, 6 vols. 8vo). Of the contents of that edition, there is a summary in the *Phrenological Journal*, x. 459. A German translation of it, entitled *Vollstandige Geisteskunde*, &c., appeared at Nuremberg in 1833; and an indifferent English version by Dr Winslow Lewis, junior, at Boston, United States, in 1835 (6 vols. 12mo). A translation of the chapters *On the Functions of the Cerebellum* is included in a volume with that title, published by G. Combe (Edin. 1838, 8vo). In answer to accusations of materialism and fatalism brought against his system, G. had early published a part of the work under the title of *Des Dispositions innées de l'Ame et de l'Esprit*, &c. (Paris, 1812). He continued to practise medicine and pursue his researches at Montrouge, near Paris, till his death, 22d August 1828. A catalogue of his collection of skulls, &c., is printed in the *Phrenological Journal*, vols. vi. and vii. As a thinker, he was original and independent; as an observer, industrious and persevering; as a writer and lecturer, forcible and clear. Even those who reject his system as insufficiently borne out by facts, allow that he has conferred signal service on science by his discoveries in the anatomy and physiology of the brain, and that by stirring to the bottom many questions regarding mind, and the organic conditions by which its phenomena are affected, he has contributed to deepen the foundations of psychology, and to render it applicable to human affairs. It is long since the apprehension of danger to religion and morality from his doctrines died away among the intelligent and well informed. In Great Britain, phrenology became known less through G.'s writings than through those of Spurzheim, who came over to England in 1814. So early, however, as 1803 it had been criticised in the *Edinburgh Review*, ii. 147. See further, *Transactions of the Phrenological Society*, p. 1 (Edin. 1824); *Phrenological Journal*, vols. 5, 8, 9, 11, 15, 16, 17, and 19; a *Historical Notice of the Discovery of the Anatomy of the Brain*, appended to G. Combe's *Phrenology Applied to Painting and Sculpture*, p. 151 (Lond. 1855); Professor Laycock on *Mind and Brain*, ii. 164, 168 (Edin. 1860).

GALL, St, one of the most important manufacturing towns of Switzerland, capital of the canton of the same name, is pleasantly situated on the left bank of the Steinach, at an elevation of 2081 feet above sea-level, and is distant 40 miles from Zürich in a straight line east-north-east. It is a well-built town, surrounded by old walls; but the ditch has been filled up and converted into garden-grounds. Among the principal buildings are the Abbey Church, which was completely modernised in the course of last century; the monastery, portions of which are now occupied by public government offices, and by the convent library, containing 1506 MSS., and among them several of the classics, that were at one time thought to have been lost. See GALL, ST, ABBEY OF. The greatest building is the schoolhouse, which contains a natural history museum and the town library. The manufactures of St G. consist chiefly of cotton goods, particularly of *Swiss muslins*. It has also linen manufactures, carries on bleaching and embroidery extensively, and is the great mart for the produce of Appenzell and Thurgau. Pop. 12,000.

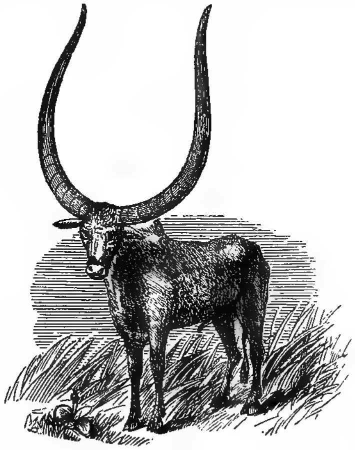
GALL, St (Ger. *St Gallen*), ABBEY OF, a celebrated Swiss Benedictine monastery, which gives its name to the canton in which it is situated. It was founded early in the 7th c. by St Gall, or Gallus, an Irish monk, a disciple of Columbanus, and one of that distinguished band, who in that age, from the various monasteries of Ireland and the kindred establishment of Iona, carried the elements of learning and civilisation over a large portion of the continent of Europe. Gallus had accompanied Columbanus to Anegray and Luxeuil, and ultimately himself, in company with a few followers, repaired to Switzerland, where, in a hermitage on the banks of the Steinach, he acquired such fame for sanctity by his teaching and example, that on his death, there arose, in honour of his memory, what, in progress of time, became one of the most celebrated of the many magnificent establishments of the Benedictine order. The succession of abbots from the days of Gallus is carefully chronicled, and the share which each of them had in the erection and enlargement of the monastic buildings. It will be enough to say that, through the piety and munificence of the faithful, the abbey of St G. gradually became one of the master-pieces of medieval architecture; and that the genius and skill which were lavished on its construction, and on the decoration of its halls and cloisters, had a large share in developing the Christian art of the period. The monks of St G., too, may be reckoned among the best friends and preservers of ancient literature. They were indefatigable in the collection and transcription of MSS.—biblical, patristic, sacred and profane history, classical, liturgical, and legendary. Some of the MSS. which are still shewn in the library are monuments of the skill and industry of the copyists; and several of the classics, especially Quintilian, Silius Italicus, and Ammianus Marcellinus, have been preserved solely through the MSS. of St Gall. For a time, the abbey was subject to the Bishop of Constance, and an animated dispute was for a long time maintained between that prelate and the monks as to the right of electing the abbot. It ended, however, in the recognition of the right of free election; and ultimately, from the growth of the monastic possessions, and the important position which the abbot held, the monastic domain, which comprised a great part of Northern Switzerland, became a distinct jurisdiction, within which the abbot, like many of his brethren in the great Benedictine monasteries, exercised all the rights of a suzerain. For several centuries, the abbey of St G. held one of the highest places in the order. Its schools enjoyed wide reputation. Its members held a distinguished place among the scholars of medieval Germany; and many of them, as, for example, Notker, are known to have cultivated not only the ordinary learning of the schools, but also physic, mathematics, and astronomy. The school of St G., too, was one of the most eminent for the cultivation of music, and its MSS., preserved in its library, have been extensively made use of by the restorers of ancient ecclesiastical music. A town of considerable importance grew up around the monastery, and was called by the same name; and as the wealth and influence which attached to the dignity of the abbot began to make it an object of ambition to the rich and powerful families, we find the succession of abbots, in the 13th and 14th centuries, sadly degenerated from their pious and learned predecessors in the office. A stringent reform was enforced about the time of the council of Constance; but the burghers of St G. had grown dissatisfied under this rule; and on the outbreak of the Reformation in 1525, they threw off their subjection, and embraced the new doctrines. At the close, however, of the religious war in 1532, the Catholic religion was re-established, and the abbot reinstated, though with diminished authority, in his ancient dignity. At the French Revolution, the abbey of St G. was secularised (1798), and its revenues were soon afterwards sequestrated (1805). By a later ecclesiastical arrangement, the abbacy of St G. was raised to the dignity of a bishopric, which, in 1823, was united to that of Chur. They were afterwards, however, separated; and in 1847, St Gallen was erected into a bishopric, with a distinct jurisdiction.

GALL, St, CANTON OF, a Swiss canton, bounded on the N. by Thurgau and the Lake of Constance, E. by the Vorarlberg, S. by the Grisons and Glarus, and W. by Zürich and Schwytz. The country is for the most part mountainous; the general slope of the surface being towards the north and north-west. Several of the summits attain a height of 6000 or 7000 feet, one (the Gallanda) a height of 8800, and one (Schirbe) that of 9000. The Rhine touches the canton of St G. near Pfeffers, and for about 50 miles forms its eastern boundary. The chief rivers that intersect the canton are the Seez, the Tamina, and the Thur. Portions of the Lakes of Constance, Zürich, and Wallenstadt, lie within its boundaries. The chief produce of the canton consists of fruit, especially apples and cherries, wine, *kirschwasser*, corn, maize, and potatoes. The amount of corn produced is but trifling, and a considerable part of the land is devoted to pasture. Iron is found in considerable abundance, and of good quality, at Gunzenberg; and coal, as also peat, is raised within the canton.

The manufactures are of linen, muslin, cotton, lace, embroidery, and glass; and wax-bleaching and tanning are also extensively carried on. The linen-trade is of very old standing. Its seat is the town of St Gall, which was celebrated for its linens as early as the 13th c., but it has in later times been almost entirely replaced by the manufacture of cotton.

The erection of St G. into a distinct canton is comparatively of recent date. It was formed upon the secularisation of the domain of the abbot by the union of the abbey territory with several districts previously subject to the older cantons—viz., the Rheinthal, Sargans, Werdenberg, Sax, Gaster, Utznach, together with the town of Rapperschwyl; so that the new canton of St G. actually encloses upon all sides the canton of Appenzell, which forms, as it were, an island within the new district. The language is a Swabian dialect of German. The canton of St G. sends eight members to the National Council. Its government is one of the most democratic in Switzerland. It consists of a Great Council, the members of which are chosen for two years by the votes of all citizens above 21 years; and who appoint from among themselves for four years an executive, called the Lesser Council, consisting of seven members. The local prefects and other district officers are elected annually in their several districts. The area of the canton is 772 square miles. Pop. (1860) 181,091, of whom 111,087 were Catholics, and the rest chiefly Calvinists. Chief town, St Gall (q. v.).

GALLA OX, or **SANGA**, a remarkable species or variety of ox inhabiting Abyssinia. The chief peculiarity is the extraordinary size of the horns, which rise from the forehead with an outward, and then an inward curve, producing a very perfect figure of a lyre, and finally curve a little outwards at the tip, to which they taper gradually. In a specimen presented by Mr Salt to the Museum of the College of Surgeons in London, the length of each horn measured round the outer side is three feet ten and a half inches, the circumference of each at the base is one foot three inches, the distance between the tips three feet four inches. A space of about three or four inches between the horns is occupied by a tuft of hair. Bruce represents the enormous growth of the horns as a kind of disease or monstrosity, accompanied with emaciation of the animal. Salt controverts this account, but figures the animal so as rather to confirm it. The G. O., however, differs from the common ox in having a hump on the shoulders, in the abrupt descent of the back towards the tail, in the greater length of the legs, and in the narrower space between the horns.



Galla Ox (copied from Vasey's work on *The Ox*).

GALLAND, Antoine, a French orientalist and numismatist, was born in 1646 at Rollot near Montdidier, in Picardy. In 1670 he accompanied the French ambassador, Nointel, to Constantinople, when he visited Jerusalem and other places. He returned to France in 1675, but subsequently made two voyages to the East. Colbert and Louvois interested themselves on his behalf, and procured him the means of devoting himself to study. In 1701, he was made a member of the Académie des Inscriptions, and in 1709, professor of Arabic in the Collége de France. He died 17th February 1715. The greatest part of G.'s writings relate to Numismatics and the East, but the thing which has secured him the most imperishable reputation, is his translation of the *Arabian Nights* in 12 vols. (*Mille et Une Nuits, Contes Arabes*, Paris, 1704—1708). This was the first translation of these grotesque and gorgeous stories ever made into any language of Christendom, and for a good while G. got the credit of being himself the author as well as the translator. Among his other writings, we may mention *Paroles remarquables, bons Mots, et Maximes des Orientaux* (Paris, 1694), and *Les Contes et Fables Indiennes de Bidpaï et de Lokman* (2 vols., Paris, 1724).

GALLAS ('invaders'), a race inhabiting the south and east of Abyssinia. The general name by which the tribes designate themselves is *Oroma* (*orma*, men). Although generally belonging to the negro race, they are not purely negroes, but form with the Fulahs, Mandingoes, and Nubas, as it were, the transition to the Semitic variety, and seem to belong to that great family inhabiting the east of Africa, from the frontiers of the Cape land to Abyssinia, and usually denominated the Kafirs. They are a vigorous, well-formed people, of a dark-brown colour, with hair frizzled, but not quite woolly, round faces, and small sharp eyes, and are distinguished not less by their energy and warlike spirit, than by their mental capacities. They first appear in history in the 16th c., as a barbarous people, extending their conquests from the interior of Africa, laying waste, by constant incursions, the countries of Eastern Africa, to the mountains of Abyssinia, gradually subduing or expelling the original inhabitants (hence their name), occupying great part of Abyssinia, and advancing as far as the Red Sea and the Gulf of Aden. It is only of late years that their power in Abyssinia, and their incursions into that country, have been partially checked, chiefly by the vigorous government of the king of Shoa, who has subdued some of the G. tribes, and induced them to profess such Christianity as exists in Abyssinia. They still, however, occupy many districts of Abyssinia, and extend their power to an indefinite extent over the countries situated south and south-west of it. Politically, the G. do not form a single nation, but are divided into numerous tribes, forming separate kingdoms and states, which are frequently at war with each other. Most of the G. follow pastoral avocations. Some, however, through intercourse with the semi-christian, semi-civilised Abyssinians, have become tillers of the soil. The wandering G. are mainly engaged in hunting and the slave-trade. The larger number of the G. are still heathens, though Mohammedanism has lately made great progress among them. Their religion bears a resemblance to that of the Kafirs.—Compare

Jomard, *Notices sur les Gallas* (Paris, 1839); Beke, *On the Origin of the Gallas* (London, 1848).

GALLATIN, ALBERT, an eminent financier and diplomatist, was born 29th January 1761, at Geneva, and educated at the university of that city. In 1780 he emigrated to the United States; and was for a short time teacher of French in Harvard College at Cambridge, Massachusetts. In 1786 he settled in the western part of Pennsylvania, and was a representative from that state in the Federal Congress from 1795 to 1801. He soon became one of the ablest debaters in that body, and was for several years the recognised leader of the Republican party. He took an active part in almost every question before Congress, and was especially distinguished for his ready and profound knowledge of political economy and finance. The first formation of the 'Committee of Ways and Means' was due to his suggestion. In 1801, President Jefferson appointed G. secretary of the Treasury, which office he filled with eminent ability during a period of twelve years. He had an important share in the negotiations for peace with England in 1814, and signed, with Adams, Clay, and the other commissioners, the treaty concluded at Ghent on the 14th of December of that year. From 1816 to 1823, G. was minister resident of the United States at Paris. In 1826, he was sent to England as ambassador extraordinary, for the purpose of settling the disputed boundary between the United States and the British possessions, and other important questions. On his return from Europe in 1827, he retired from public employment, and became a resident of New York city. In 1843, he was elected president of the New York Historical Society, which position he held till his death. He was one of the founders, and the first president of the American Ethnological Society. He was the author of a number of valuable publications on the currency and other subjects. He made the languages and characteristics of the native tribes of North America a subject of profound study, and published several papers on this department of ethnology. G. died 12th of August 1849, in his 89th year.

GALL-BLADDER. See LIVER.

GALLE'GO, one of the principal affluents of the Ebro, rises at the southern base of the Pyrenees in the province of Huesca, flows south, and after a course of about 90 miles, joins the Ebro a mile below Zaragoza.

GA'LLEON (augmentative of *Galley*), a name formerly applied to ships-of-war of three or four gun-decks, but subsequently transferred to the large merchant-vessels which every year brought to Spain the gold, silver, and other wealth contributed by its Mexican and South American colonies. They were armed, but being heavy unmanageable vessels, and of immense value, were eagerly sought after as prizes whenever a war broke out.

GA'LLERY, in a *military* sense, is a covered passage, cut through the earth or masonry in a fortification, either as a means of communication, or as a position whence a musketry-fire can be maintained through loopholes. For the latter purpose, galleries are formed occasionally in the counterscarps of dry ditches, where their defenders exercise a flanking fire upon the ditch. With regard to listening galleries, see MINES, MILITARY.

In a *naval* signification, a gallery is a sort of balcony projecting from the stern and stern-quarters of large ships. As an adjunct to the principal cabins, galleries form an agreeable resort during fine weather. Under the article DAVIT, the gallery of a man-of-war is shewn.

GALLERY, a word with several applications in architecture. A long passage or corridor is called a gallery. A long room, such as is frequently used for exhibiting pictures—a raised floor in any apartment, supported on pillars—a long passage in the thickness of the wall, or supported on cantalivers (as the Whispering Gallery of St Paul's): all these are called galleries. They were of very frequent use in the buildings of the middle ages. The Roodloft (q. v.) is a gallery running across a church at the entrance to the choir, and supporting a large cross. Organ galleries are also frequent, either in the position of the roodloft, or at one end of the nave or transept, or corbelled out from the side-wall.

In old baronial halls, the end next the door was usually screened off for the domestics, and above the screen was almost invariably a gallery for musicians.

In the older German and French churches, the side-aisles were divided into two stories—the upper forming a gallery said to be for the exclusive use of the women.

The arrangement of galleries in tiers one over the other, now so much used in churches, theatres, &c., is entirely modern, dating from the 17th century.

GALLEY, a long, low-built, narrow ship with one deck, much used in the Mediterranean prior to the introduction of steam, and still extant there. Galleys are propelled by sails and numerous oars, the latter being usually worked by convicts or galley-slaves, who are chained to them. The largest vessels of this class were those of the Venetians, some reaching a length of 162 feet, and carrying 12 guns: of these, *half-galleys* and *quarter-galleys* were diminutives. From their small elevation above the sea and swift movement, they were formidable enemies, even to much larger vessels, when smooth water gave play to their evolutions. During the great French war, numberless galleys, fitted as gun-boats, were ready to issue from the Mediterranean ports of Spain and France whenever a British ship was becalmed or disabled near the shore. The celebrated Algerine corsairs committed most of their piracies in swift galleys, which were commonly rowed by the forced labour of Christian slaves.

On board an English ship, the *galley* is the place where the cooking is carried on for the whole ship's company; it is on one of the lower decks, in the forepart of the vessel.

Galley is likewise applied to some of the boats of a ship-of-war; the captain's galley being usually a swift and elegant boat propelled by six alternate oars.

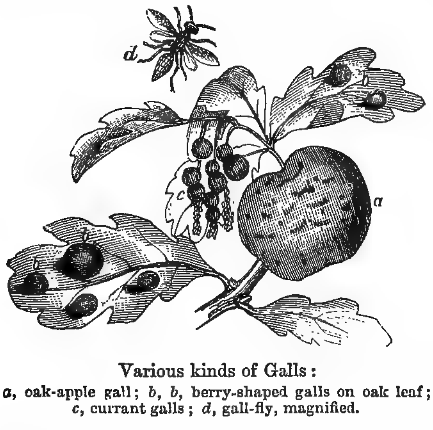
GALLEY, in Heraldry. See LYMPHAD.

GALLEY HALFPENCE. These were coins of Genoa, brought into England by the galley-men, or men that came up in the galleys with wine or merchandise, and thence called galley halfpence. They were broader than the English halfpenny, but not so thick, and probably base metal, because, by 11 Hen. IV. c. 5, and 13 Hen. IV. c. 6, galley halfpence were prohibited as a legal tender. The galleys unloaded at the east end of Lower Thames Street, thence called Galley Quay, where, in the 17th c., were struck tradesmen's tokens, thereof called Galley Quay halfpence (Timbs).

GALLEY-SLAVE. See BAGNES.

GALL-FLY (*Cynips*), a Linnæan genus of insects, now forming the family *Gallicolæ* (Lat. gall-inhabiting) of entomologists, and belonging to the order *Hymenoptera* (q. v.), section *Terebrantia* (Lat. boring), which section is characterised by the females being furnished with an *ovipositor*. Gall-flies are nearly allied to ichneumons, but principally differ from them in depositing their eggs not in the bodies of the larvæ of other insects, nor in their nests, but in plants, on the juices of which their larvæ are nourished. The ovipositor of the female is long, slender, in part spirally rolled up when not in use, and lodged in a groove on the under-side of the abdomen, near the origin of which it is attached; it has at its extremity lateral teeth forming a kind of saw. By means of this organ, the insect makes a minute puncture where she is to deposit her egg, which is sometimes in a leaf, and then generally in one of the ribs of the leaf, sometimes in a young shoot or twig, sometimes in a bud, or in some other part of a plant, not excepting the roots; each species of gall-fly choosing some particular plant, and some particular part of the plant, to which it confines its attacks. An irritant fluid is supposed to be lodged in the puncture along with the minute egg, as a tumour immediately begins to form, becoming an excrescence known as a *gall.* The egg itself increases in size before it is hatched; the gall very rapidly attains its full dimensions; and within it the larva of the gall-fly feeds on the juices of the plant in their most concentrated form; for galls are found to contain the peculiar principles of the plants on which they grow in greater abundance than the adjoining or other parts. It is not until the larva has undergone its transformations, first into the *pupa,* and then into the perfect insect, that it eats its way out of the gall in which it has previously existed. See GALLS.

Bedeguar gall of Wild Rose.



Various kinds of Galls:
a, oak-apple gall; *b*, *b*, berry-shaped galls on oak leaf; *c*, currant galls; *d*, gall-fly, magnified.

GA'LLIARD (from the French *gaillard,* and that again from *gai*, sprightly) is the name of a lively dance, the same, according to Brossard, as the *Romanesca*, a favourite dance with the Italians. The air is mostly in $\frac{3}{8}$ or $\frac{3}{4}$ time, but sometimes also in $\frac{2}{4}$ or $\frac{4}{4}$ time. The tempo is also quick and lively, with a flowing melody. A writer in *Notes and Queries* (vol. vii. pages 216, 217) says that he knows at least a hundred different galliard tunes, which are distinguished by different names, probably to indicate with whom they were favourites, such as *The King of Denmark's Galliard; The Earl of Essex's Galliard;* &c.

GALLIC ACID ($C_{14}H_6O_{10},2HO$) occurs in the form of colourless silky needles which lose their water of crystallisation at 212°; they dissolve slightly in cold water, but require only three parts of boiling water for their solution, and they are freely soluble in alcohol. Solutions of gallic acid have an acid reaction and a sour astringent taste; with the persalts of iron they yield a deep blue colour, and no apparent reaction occurs when they are mixed with a solution of gelatine. The gallates of the alkalies, especially if an excess of the base be present, speedily absorb oxygen, and become brown when exposed to the air; and hence they may be usefully employed in Eudiometry. Gallic acid possesses the property of reducing the salts of gold and silver, and it is on this account that it has been employed in photography.

Gallic acid exists ready formed in small quantity in gall-nuts, in valonia (the acorn-cup of *Quercus ægilops*), in divi-divi (the pod of *Cæsalpina coriaria*), in sumach, and other vegetables. It is formed in association with glycose from Gallotannic Acid (q. v.), when the latter is boiled with dilute sulphuric or hydrochloric acid; it is likewise produced by boiling a solution of gallotannic acid with caustic alkalies, or (more slowly) by simply exposing a solution of gall-nuts to the air, the process of oxygenation being apparently favoured by the presence of a ferment contained in the gall-nut.

To obtain gallic acid, we mix powdered gall-nuts with water, and expose them freely and for a long time to the air at a temperature of 70° or 80°. The tannin or gallotannic acid becomes gradually converted into gallic acid. We pour away the supernatant brown fluid, and take up the gallic acid from the residue with boiling water, decolorise with animal charcoal, and crystallise.

When gallic acid is exposed to a temperature of from 410° to 420°, it is converted into carbonic acid and *Pyrogallic Acid* (q. v.) ($C_{12}H_6O_6$), which is sublimed, 31 or 32 parts of the latter acid being yielded by 100 of gallic acid. The reaction is represented by the formula—

$$\overbrace{C_{14}H_6O_{10}}^{\text{Gallic Acid.}} = \overset{\text{Carbonic Acid.}}{2CO_2} + \overbrace{C_{12}H_6O_6}^{\text{Pyrogallic Acid.}}$$

If gallic acid is mixed with five times its weight of oil of vitriol, a crimson solution is formed, which, if gradually dropped into water, deposits a red substance, partly in granules and partly in crystals. The crystals are *Rufigallic acid* ($C_{14}H_4O_8,2HO$).

Gallic acid is used in medicine as an astringent. The late Dr Todd regarded it as the best styptic that we possess in all cases of internal hæmorrhage, whether hæmoptysis, hæmatemesis, or hæmaturia. The symptoms of Bright's disease of the kidney have also been much alleviated by its use. It may be given in doses of from three to ten grains three or four times a day. As a topical agent in arresting hæmorrhage from external wounds, it is greatly inferior to tannin.

GA'LLICAN CHURCH, the Church of France, less, however, considered under the relation of geographical boundaries than in its constitution and principles of church government. The Christian faith was widely diffused in France, even during the lifetime of the apostles; and it especially flourished among the descendants of the Greek colonies of the south, and in the numerous towns and cities upon the Rhone and its confluent rivers. In the persecutions to which the early professors of Christianity were subjected, the Christians of these churches had their full share; and one of the most touching monuments of early Christian literature, is the letter of the Christians of Lyon and Vienne to their brethren in Asia, on the martyrs of these churches, which Eusebius has preserved in his *Ecclesiastical History* (book v. c. 1). Although sharing in the general literary inferiority to their eastern brethren which characterises Western ecclesiastics during the early period, the church of Gaul numbers several eminent names in the literature of the 3d, 4th, and 5th centuries. The works of Irenæus, Bishop of Lyon, are among the most important for the history of doctrine of all the early patristic remains; and in the following century, Sulpicius Severus, Hilary of Poitiers, Hilary of Arles, Vincent of Lerins, Prosper, Victor, Eucherius, Salvian, and other writers, combine to form a body of literature of which the later modern representatives of the French Church are not unreasonably proud. The hierarchical organisation, also, of the church of Gaul was, at a very early period, among the most complete and regular throughout the churches of western Christendom; and in the council held at Arles in 314, we even recognise the titles of many bishops of sees which are still represented in the catalogue of the French episcopacy.

But the history of the G. C., so far as regards the development of those peculiar principles which have acquired a distinctive name and status in Roman Catholic theology, begins at a much later period. We shall see elsewhere the origin and progress of the temporal power of the papacy. See PAPACY. It will be enough, in this place, to observe, that, from circumstances which are differently viewed by the opposite schools of theology, the Roman pontiffs began, from the very date of the establishment of the Western Empire, to exercise a large and widely extended influence over the civil as well as ecclesiastical affairs of the several European kingdoms. On the other hand, owing to the intimate connection between the church and state in most of these kingdoms, and especially to the feudal relations between the crown and the church dignitaries, most of whom held the temporalities of their benefices under the crown by the ordinary feudatory tenure, the crown also asserted a correlative claim to certain privileges in respect of ecclesiastical affairs. The satisfactory adjustment of these conflicting claims was the great problem of medieval polity; and the alternations of the struggle between them form the staple of medieval history. More than one of the French sovereigns engaged in a conflict with the Roman see as to the respective authority of the two powers; these conflicts naturally called out a division of opinion among the members of the church of France, one party supporting the papal claims, and the other maintaining the adverse prerogatives of the French crown, and the privileges of the national church of France. The latter party, professing to represent the rights of the G. C., have given a name to the principles which they profess; and the appellation of Gallicanism has come to designate, in general, that system in Roman Catholic theology which, while it recognises the primacy of the Roman pontiff, by divine right, over the universal church, yet asserts the independence of national churches in many details of self-government and of local discipline, and limits the exercise of the papal prerogatives by canons and decrees of general councils and by the laws of the universal church. It must be added that, while the Gallican theory to this extent claims an exemption from dependence upon the authority of the Roman pontiff, it acquiesces, on the other hand, to an almost proportionate degree, in the assumption of ecclesiastical authority on the part of the state. Gallicanism, in truth, in many of its details, falls into the grossest form of Erastianism.

We can recognise the working of these principles in the opposition which the so-called Isidorian Decretals (see ISIDORIAN DECRETALS, HINCMAR OF RHEIMS) encountered in France; and although the body of the clergy stood aloof, they were carried to their most extreme extent by Philippe the Handsome in his contest with Boniface VIII. The conflicting claims of the rival popes in the Western Schism (see WESTERN SCHISM) tended still more to weaken the papal authority; and the expedient which was then adopted for the extinction of the schism—viz., that of convening a general council to pronounce upon the respective claims of the pretenders to the papacy, gave prominence and significancy to what has since been regarded as one of the leading dogmas of Gallicanism—the superiority in point of authority of a general council to the pope. The details, too, of the disciplinary enactments of the councils of Constance and Basel, which were drawn up in this spirit, were mainly directed towards the limitation of the papal authority in the exercise of church patronage within the limits of the national church; and these enactments were in the main embodied into the French law by the celebrated Pragmatic Sanction of 1438. See PRAGMATIC SANCTION.

The Pragmatic Sanction was superseded in 1512 by the concordat of Leo X. with Francis I. The large share in the dispensation of church patronage which the French crown enjoyed under that concordat had the effect of still further nationalising the French Church, and increasing the jealousy of the crown as to the papal interference. The great jurists, Pithou and Duping, in asserting the liberties of the church, equally enforced the privileges of the crown. In the development of the absolutism of the monarchy, which reached its height under Louis XIV., the ecclesiastical prerogative of the crown was enlarged as much as its political authority; and a contest which arose between this monarch and Innocent XI., on the right of the crown to the so-called *Droit de Regale* (see REGALIA), led to the well-known declaration of the French clergy in 1682, which has since been regarded as the charter of Gallicanism. This formulary emanated from an assembly of the French clergy, held by royal authority in 1682, at which the celebrated Bossuet was present. It consists of four articles. The first declares that 'the jurisdiction of St Peter and his successors in the Roman see as vicars of Christ on earth, although divinely bestowed, is confined to things spiritual and appertaining to salvation, and does not extend to civil or temporal affairs.' The article therefore declares 'that princes are not subject in temporal things to any ecclesiastical authority;' that they cannot be deposed 'either directly or indirectly by the power of the keys, and that their subjects cannot be dispensed from their subjection or released from their allegiance.' The second article renews the declaration of the council of Constance with regard to the superiority of a general council over the pope, and declares that that article is not to be restricted in its application to a period of schism such as existed at the time of the council. The third asserts that the authority of the pope is 'to be restricted by the canons of the universal church,' and that 'the rules, customs, and institutions of the Gallican kingdom and church remain in full force.' This is the article which asserts the celebrated 'Gallican Liberties.' The fourth article, while it concedes to the pope 'the chief part in questions of faith,' and professes that 'his decrees extend to each and every church,' nevertheless maintains 'that his judgment is not irreformable, unless it shall have been confirmed by the consent of the entire church.' The chief rules, customs, and institutions of the G. C. referred to in the third article are, that the G. C. does not receive all the decrees of councils and of popes in matters of discipline, and that those only are in force which are so received; that the G. C. holds itself free to receive or reject the rules of the Roman chancery; that the Roman pontiff cannot levy any impost from the French clergy without their own consent; that he cannot bestow of his own motion on a foreigner any benefice within the French Church; that neither he nor his legates can hear French causes in 'the first instance,' and that even in cases of appeal he is bound to assign native judges to hear the appeal, even when the appellant should be a metropolitan or primate; that the French bishops shall not be required to attend any general council unless with the permission of the crown. The last of these 'customs,' as also those which make the receiving or not receiving the general canons of discipline optional in France, and which practically throw the decision into the hands of the civil power, have been with much show of reason denominated the 'Slaveries' rather than the 'Liberties' of the Gallican Church.

This 'Declaration' was strenuously enforced by Louis XIV. It was imposed upon the universities and all public ecclesiastical bodies, and its acceptance was made a condition of appointment to offices in the church; but it was in the same proportion distasteful to the popes. It was condemned by Alexander VIII. in 1690, by Clement XI. in 1706, and again by Pius VI. in 1794; but both the acceptance of the articles by the French clergy, and the condemnation of them by the Roman pontiffs, are understood to be with certain reservations as to the particular doctrines. Within the present century, and especially since the late collision between the civil and ecclesiastical authority, the opinions of the French clergy have undergone a decided change. The Gallican doctrines are now much less commonly held, and in a less extreme form. The same doctrines were also adopted in other national churches, and especially in the ecclesiastical principalities of Germany (see Febronianism), and in the German empire under Joseph II. Here, also, they have fallen into discredit with the church party.

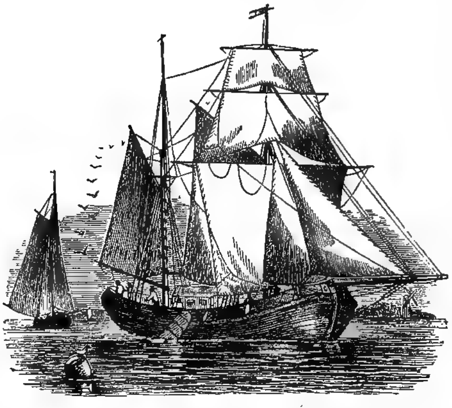
The G. C. underwent very extensive modifications at the close of the 18th and the beginning of the present century, not merely by the enactment of what was called the 'civil constitution of the clergy,' and which introduced into the constitution of the church a large infusion of the presbyterian, and even the democratic element, but by the concordat of Pius VII. with Bonaparte as First Consul, which reduced the number of sees, brought the ecclesiastical divisions of the country into harmony with its new political distribution into departments, diminished the number of festivals, and confirmed the suppression of the ancient religious establishments, and the confiscation of the church property throughout France. Under the present emperor, the Church of France has recovered somewhat of her old external prestige. Compare De Maistre's *De l'Eglise Gallicane;* Dupin, *Les Libertés de l'Eglise Gallicane* (Paris, 1824); and Fraysinous, *Les Vrais Principes de l'Eglise Gallicane.*

GALLIE'NUS, Publius Licinius, a Roman emperor from the year 259 A. D.—when his father Valerian, who had made him co-regent with himself, was taken prisoner by the Persians—to 268 A. D. His authority was limited almost entirely to Italy, for throughout the provinces the legions for the most part revolted, and raised their commanders to the dignity of Cæsars. Hence the period is known in history as the Time of the Thirty Tyrants. In the East, the honour of the Roman arms was maintained by Aurelian, Probus, and others, who found a useful ally in Odenathus, ruler of Palmyra, and his wife Zenobia (q. v.), to whom G. intrusted the care of the war against the Persians. In the West, however, dangers thickened about him. Aureolus was proclaimed emperor by the legions of Illyricum, and having marched into Italy, seized Milan, and proceeded towards Rome. The war between the two was carried on for some time with undecided success, but G., while besieging his adversary in Mediolanum (Milan), was murdered by some of his officers, 268 A. D. He was succeeded by Claudius II.

GALLINA'CEOUS BIRDS (Lat. *gallus*, a cock), or **RASORES** (Lat. scrapers), an order of birds, more generally valuable to man than any other order, containing at once the most important species domesticated as poultry, and those most sought after as game. The common Domestic Fowl may be regarded as the type of the order. Like it, the gallinaceous birds in general have a small head; a rather short bill, with the upper mandible a little arched; nostrils placed on the sides of the bill, and usually in a soft membranous space at its base; the figure bulky; the wings short, and not governed by powerful muscles, nor adapted for long or rapid flight; the feet with three toes before, and one behind—which is articulated higher than the others, and is sometimes wanting—adapted for walking on the ground and for scraping, which is much resorted to, in order to procure food and for other purposes; the digestive organs complex, the *crop* large, the *gizzard* very muscular, the *intestine* long, with two very large *cœca.* The head, at least of the males, is very generally furnished with appendages, as a crest, comb, wattles, &c. The feet of the males are also often furnished with *spurs*, and at least during the breeding season the males are very quarrelsome. The males of many species are birds of splendid plumage; that of the females is sober, but females of very advanced age often assume a plumage similar to that of the males. Some of the gallinaceous birds are polygamous, some pair at the breeding season; the nest of all of them is artless, and the males take no part in incubation, nor in the rearing of the young. The young are comparatively feathered when hatched, and are immediately able to run about and pick up food for themselves, but are for some time most affectionately tended and protected by their mother, and by her the proper food is sought for them and pointed out to them, or broken into sufficiently small pieces, and laid before them. The gallinaceous birds have unmelodious voices. Except the curassows, they make their nests on the ground. Some of them are found in almost all parts of the world. Besides those already named, guans, pheasants, grouse, partridges, quails, ptarmigans, peacocks, turkeys, guinea-fowls, tragopans, and tinamous, may be mentioned as examples of this order. Pigeons are generally ranked in it by ornithologists, but rather doubtfully, as they differ not a little from the true gallinaceous birds. See Columbidæ. Interesting analogies have been pointed out between this order of birds and the order of Ruminants among Mammals, in the complexity of the digestive organs, bulkiness of the frame, low intelligence, easy domestication, usefulness to man, and proneness to variation from the influence of external circumstances, giving rise to different breeds.

GA'LLINULE (*Gallinula*), a genus of birds of the family *Rallidæ*, closely allied to the Coots (q. v.), and having the upper mandible similarly extending on the forehead in a naked soft plate, but the toes furnished with an undivided narrow marginal membrane. This membrane, however, and the great length of the toes, enable the gallinules to swim well, and all of them are aquatic. The species are pretty numerous, some of them confined to tropical regions. One only is found in Britain, the COMMON G. (*G. chloropus*), also known as the WATER-HEN, or MOOR-HEN. It is a very widely diffused species, being found in most parts of the world. The G. is about 13 inches in length, the tail very short; the general colour of the plumage deep olive brown on the upper parts, blackish gray beneath, the ridge of the wing and the under tail-coverts white. The bill is red at the base, and yellowish green at the tip; the legs and toes green. In situations favourable for them, such as artificial ponds, gallinules may often be seen in considerable numbers together, swimming with a peculiar nodding motion of the head. They seek their food both on the surface of the water and by diving, partly also among the grass of meadows and river-banks. A frequent jerking of the tail is very characteristic of them. When alarmed, they sometimes seek safety by flight, but more frequently by hiding among rushes or reeds. They make their nests near the water which they frequent, and usually on the ground among stumps, roots, and reeds; the nest contains from seven to ten eggs. The flesh of the G. is well flavoured.

GA'LLIOT, a Dutch vessel carrying a main and a mizzen mast, and a large gaff-mainsail. Galliots—strong-built, flat-bottomed ships—of 400 to 500 tons burden, were formerly used also as bomb-vessels.



Dutch Galliot (from the *Boy's Own Book of Boats*).

GALLI'POLI (the *Callipolis* of the Greeks), an important commercial town of Italy, in the Neapolitan province of Terra di Otranto, is beautifully situated on the eastern shore of the Gulf of Taranto, on a steep insulated rock in the sea, connected with the mainland by a fine arched bridge of stone. It has a good harbour, although somewhat difficult of access, owing to the rocks surrounding its entrance, and in time of war is an important position, being strongly protected by fortifications and a castle, as well as by the peculiarity of its site. G. is remarkable for its oil-tanks, excavated in the solid limestone, in which the famous oil of Puglia is deposited for exportation. Pop. 10,653. It is the see of a bishop. In 1834, the revenue from the oil-trade amounted to 8,187,355 francs. Other interesting features of the place are the ancient fountain, a fine monument of antiquity, and adorned with antique figures in bas-relief; the castle, erected by Charles of Anjou, commanding the port and bridge, and possessing considerable defensive strength; and the cathedral, erected in 1629 by Francesco Bischettini, and containing some fine paintings of Coppola.

It is said that Christianity was introduced here as early as 44 A. D. In 450, the town was sacked by the Vandals; in 1284, it was destroyed and almost depopulated by Charles of Anjou; and during subsequent centuries, suffered severely from the Venetians, French, Spaniards, and Turks. See *Viaggi in Sicilia ed in Gallipoli*, by Baron Riedesel.

GALLIPOLI, PENINSULA OF (the ancient Thracian Chersonesus), a portion of the province of Rumili, in European Turkey, is situated between 40° 3′ and 40° 38′ N., and separates the strait of Dardanelles on the east from the Gulf of Saros on the west. It extends in a south-west direction, is about 55 miles in length, and varies from 4 to 13 miles in breadth. The principal town on the peninsula is Gallipoli (q. v.).

GALLIPOLI, an important town and seaport of Turkey in Europe, in the province of Rumili, is situated on the peninsula of the same name, at the north-eastern extremity of the strait of the Dardanelles, and is 90 miles south of Adrianople, and about 130 miles west-south-west of Constantinople. It was once fortified, but its only defence now is 'a sorry square castle with an old tower.' G. is poorly and irregularly built, its houses miserable, and its streets dirty, but its bazaars are extensive and well stocked. It is the most important town on the Hellespont, has two ports, and numerous fountains and mosques; and its inhabitants, comprising merchants of all nations, carry on a flourishing trade in corn, wine, oil, &c. Pop. 30,000.

G. is the see of a Greek bishop. In the town and neighbourhood are seen many remains of ancient sculpture and architecture, the most noteworthy of which are the magazine and cellars built by Justinian. The town was taken by the Turks in 1357, and formed the earliest Turkish possession in Europe.

GA'LLIPOT, the name given to a pot painted and glazed, commonly used for medicine. The origin of the name is uncertain, some deriving it from the Dutch *gleye*, clay, or *glei*, glaze, and others from the Spanish *gala*. There seems to be some doubt whether the word 'galley' does not apply to the shape. Glazed coloured tiles, however, were called 'galletyles.' The earliest mention of gallipots is in Sir T. Howard's Household Book of the year 1465, edited by the Roxburghe Club, *Archæol. Jour.* 1861, p. 138.

GA'LLIVATS, large row-boats, formerly, and still to some degree, used in eastern waters. They rarely exceed seventy tons, carry two masts with high triangular sails, and are generally armed with a few small swivel guns, fastened on the bulwarks. The Malay pirates employ these swift but somewhat fragile vessels.

GALLOMA'NIA. See ANGLOMANIA.

GALLON, the standard measure for liquids and dry goods throughout the United Kingdom. It has existed as a measure from the earliest times, and, in consequence, has undergone many changes. In the time of Henry III., it was enacted that the gallon should be 8 lbs. of 12 ounces each, an ounce being the weight of 640 dry grains of wheat from the middle of the ear.

In 1650, there were three distinct gallon measures —viz., 1, the gallon measure in common use, which contained about 231 cubic inches: 2, the customary standard at the Guildhall, which, though not a legal standard, was frequently referred to as such, even by the law-officers of the crown; and though generally estimated at 231 cubic inches, in reality contained only 224: 3, there was also the legal standard measure, preserved at the Treasury, which contained 282 cubic inches.

Besides these three, there was another gallon measure frequently employed for measuring corn, called the Winchester gallon. This measure, though directed in William III.'s reign to contain 269 cubic inches, was soon afterwards changed to 272¼ cubic inches, at which value it remained for a long period.

In 1706, the gallon of 231 cubic inches was made the standard wine gallon.

These measures were gradually changed in value, and appropriated to the measurement of particular substances, till, in 1825, just before the passing of the 'Act for Ascertaining and Establishing Uniformity of Weights and Measures,' they stood thus:

In old dry or corn measure,	the gallon = 268·6	cubic inches.
In old wine measure,	" " = 230·85	" "
In old ale and beer measure,	" " = 282·	" "

In January 1826, when the above-mentioned act came into operation, all these measures were abolished, and it was enacted that the standard measure of capacity for all liquids and for dry goods not measured by heaping, shall be a gallon containing 10 lbs. av. of distilled water, weighed in air (the barometer being at 30 inches, and the thermometer at 62°).

This gives 277·274 cubic inches for the imperial gallon, and by subdivision or multiplication of this standard, the other measures can easily be found. See WEIGHTS AND MEASURES.

GALLOO'N, a narrow fabric composed of silk or worsted, or of both. It is usually employed for binding garments, curtains, &c. The small band worn round gentlemen's hats is an example.

GALLOTA'NNIC ACID ($C_{54}H_{22}O_{34}$) is the most important of the various forms of tannin or tannic acid. It usually occurs as a spongy, light, inodorous, colourless, or faintly yellow mass, which is easily reduced to a fine powder, which possesses a strongly astringent, but not a bitter taste. It is freely soluble in water, the solution reddening litmus paper, and dissolving the carbonates with effervescence. With the persalts of iron, gallotannic acid gives a blackish blue precipitate of gallotannate of iron, and even when the iron solution is extremely dilute, a violet tint is evolved. This gallotannate of iron is the basis of ordinary writing ink (q. v.); and the reaction that we have described is so sensitive, that gallotannic acid is employed in the laboratory as a test for the detection of the persalts of iron. Gallotannic acid likewise precipitates tartar emetic, nearly all the vegetable alkaloids (morphia, quinia, &c.), the albuminates, and gelatine. If a piece of raw hide, freed from hair, be immersed in a solution of gallotannic acid, the gelatigenous tissue and the acid combine, and leather is formed; and if the skin be of sufficient size, all the gallotannic acid is removed from the solution.

Gallotannic acid fuses when exposed to heat, and at a temperature of about 120° it is decomposed, and yields pyrogallic acid ($C_{12}H_6O_6$) and metagallic acid ($C_{12}H_4O_4$), while water and carbonic acid are expelled. When a watery solution of gallotannic acid is excluded from the air, it remains unchanged; but if the air is allowed free access to it, a fungous or mouldy growth is developed, oxygen is absorbed, carbonic acid is given off, and the gallotannic acid becomes decomposed into Gallic Acid (q. v.) and sugar. The same decomposition is more rapidly induced by the action of dilute sulphuric acid, the reaction being exhibited in the following formula:

$$\overbrace{C_{54}H_{22}O_{34}}^{\text{Gallotannic Acid.}} + \overbrace{8HO}^{\text{Water.}} = \overbrace{3(C_{14}H_6O_{10})}^{\text{Gallic Acid.}} + \overbrace{C_{12}H_{12}O_{12}}^{\text{Sugar.}}$$

On boiling gallotannic acid in a concentrated solution of potash, gallic acid is also formed.

The composition of the salts of this acid is but imperfectly known, but the acid is generally considered as tribasic. None of the salts crystallise, and when in solution or in a moist state, they rapidly absorb oxygen, and become decomposed.

Gallotannic acid occurs in large quantity in the gall-nut, which contains, according to Pelouze, as much as 40 per cent. of this acid, and 3·5 per cent. of gallic acid (Guibourt has found that some nuts contain as much as 65 per cent. of gallotannic acid); it is likewise found in all parts of the gall or dyer's oak (*Quercus infectoria*), in sumach (*Rhus coriaria*), and in green tea.

The best method of obtaining it is from powdered gall-nuts, by extraction with commercial ether (which contains about 10 per cent. of water), in the percolation or displacement apparatus.

Gallotannic acid is employed in medicine, in chemistry, and in the arts. Its uses in medicine are due to its powerful astringent action. It is employed topically as a styptic in wounds, bleeding gums, piles, &c., and internally as an astringent in hæmorrhage from the lungs, stomach, bowels, &c.; as we know that it becomes converted into gallic acid in its passage through the system, it is probably the latter acid which acts on remote parts when gallotannic acid is administered. Internally, it may be given in doses of from three to ten grains, three or four times a day, in pills or in solution. It may be used as an astringent gargle or lotion, in the form of a watery solution containing three or more grains to the ounce. The *compound ointment of galls*, which is the best topical remedy for piles without hæmorrhage, owes its efficacy to the gallotannic acid contained in the powdered galls.

In chemistry, it is used in solution as a test for gelatine, persalts of iron, &c.; and in the arts, it serves various useful processes, especially in relation to the preparation of leather, and the manufacture of white wines.

GA'LLOWAY, the name of an ancient province in the south of Scotland, still employed to designate the counties of Kirkcudbright and Wigton. The extent and early history of G. are alike obscure. By some historians, it has been asserted to have comprehended, in addition to Kirkcudbright and Wigton, Nithsdale, Annandale, Teviotdale, Carrick, Kyle, Cunningham, and Renfrewshire; but the evidence for such assertion is not satisfactory. Gallwegia is mentioned in 1124, in a charter granted by David I. of Scotland to the monks of Selkirk, and at that time its dimensions appear to have been no larger than those the modern application of the name implies. Of the eight tributary princes who are said to have waited upon Edgar king of England at Chester, in 973, one was 'Jacobus rex Galwalliæ.' The name, however, must have come into use after the time of Bede the historian (died 735), for in speaking of the province, which then formed part of the Bernician or Northumbrian kingdom, he makes no mention of it. Its origin is doubtful, but has obvious reference to the Gaelic people by whom it was possessed. The original inhabitants of the country appear to have been of Celtic origin; they are believed to have formed two distinct tribes, the Selgovæ and Novantes—the former holding the country east of the Dee, along with a portion of Dumfriesshire, while the latter held the portion lying to the west. After the departure of the Romans, in the first half of the 5th c., G. was overrun by the Anglo-Saxons of Northumbria, by whom, however, the native Celtic inhabitants do not appear to have been ever thoroughly subdued. About the 12th c., G. is spoken of by English writers as 'the land of the Picts,' and its inhabitants as 'the Picts.' In Scottish charters, the inhabitants were called simply 'Gallovidienses,' or men of Galloway. G. was now ruled by its own princes and its own laws, the kings of Scotland, however, exercising a nominal sovereignty over it. It was not until the reign of Alexander II. that the power of these great chieftains was completely broken by the crown. The last of them, Alan of Galloway, constable of Scotland, died in 1233, when his great possessions were divided among his three daughters. For the extent, population, natural productions, &c., of G., see KIRKCUDBRIGHTSHIRE and WIGTONSHIRE.

GALLOWAY, MULL OF, a rocky headland, the southern extremity of the peninsula called the Rinns of Galloway, in Wigtonshire, is the most southern point of Scotland. It is 1½ mile long, and ¼ of a mile broad. On this headland, in lat. 54° 38′ N., and long. 4° 52′ W., is a light-house, 325 feet above the level of the sea, the light of which is seen at the distance of 21 nautical miles.

GALLOWS, PIT and G. See FOSSA ET FURCA; also, EXECUTION, HANGING.

GALLOWS-BITS, the name applied on board ship to two strong frames of oak, on which the spare topmasts and yards are lashed.

GALLS, or **GALL-NUTS**, are of various shapes, but the oak-galls chiefly used in commerce are nearly globular, with slightly pointed excrescences sparingly placed on their surface. They are remarkable for containing a peculiar acid called *gallic*, which is only an altered condition of tannic acid, and their value is entirely due to the great accumulation of this principle in the diseased condition of the vegetable tissue which constitutes the gall. This gallic acid (q. v.) is easily separated in the form of beautiful white acicular crystals, which, after a little exposure, become pale yellow. It is in extensive demand as a fixing agent for photographic pictures. Until this demand was created, only three or four kinds of galls were known in commerce, and these were almost wholly employed for dyeing purposes, a small quantity of the common Turkish galls being also used medicinally; now, several others are imported in considerable quantities. The following are the chief:

1. The Turkish galls, of two kinds, *blue* and *white;* these are by far the most common in use. They are chiefly imported from Constantinople and Smyrna, from which places the average imports of the last five years have amounted to 300 tons—an enormous quantity, when we consider how they are produced, and the industry necessary to collect so vast a quantity. They are each about the size of a round nutmeg, and the blue, which are the best, are entire, being gathered before the escape of the insect. The so-called white galls are of a yellowish-brown colour, and each is perforated with a small round hole, about the sixteenth of an inch in diameter, whence the insect has escaped. These galls are produced by a species of Cynips (*C. quercus-galli*) on the dyer's oak (*Quercus infectoria*), a native of Asia Minor, from the Bosphorus to Syria, and from the Grecian Archipelago to the frontiers of Persia. Of this kind of gall, several varieties are known in commerce, as the Aleppo galls; the Syrian or Mosul galls, which are the best known; the Tripoli Taraplus or Tarablous galls, obtained from Constantinople; and the Smyrna galls.

2. The small Aleppo or coriander gall, which is generally about the size of a large pea. They are always perforated or empty galls, and are of a brownish-yellow colour, round, and with small blunt spines. The quantity used in this country is not very large.

3. The large Bassorah, Bussorah, or Mecca galls, which are the largest galls known in commerce; they are as large as an Orleans plum, smooth, except a ring of curious slightly raised excrescences sometimes found round the middle, dividing the gall into two hemispheres. They are reddish brown, and are said, when on the trees (*Quercus infectoria*), to be coloured as brightly as apples. These are the apples of Sodom, or the Dead Sea apples, bright to the eye, but filled with a gritty astringent matter, which is likened to ashes; it is formed on the *Quercus infectoria* by *Cynips insana*. These are not extensively imported.

4. The acorn gall, Knoppern, Knobben, Hungarian, or German gall. This is found chiefly in Hungary, and is much used by the German dyers; it is also occasionally used in this country. It is a curious irregular-shaped brown gall, deeply furrowed, and covered with angular excrescences. It is produced on the common oak (*Quercus pedunculata*) by *Cynips Quercûs calycis*.

5. The small East Indian galls called Mahee, and Sumrut-ool-toorfa, are obtained from the Indian Tamarisk (*Tamarix Indica*). They are very small, about the size and colour of tares, and are so rough and irregular in form, that they look rather like little lumps of dried garden-soil.

6. The Chinese galls, or Woo-pei-tsze. These very curious vegetable excrescences were regarded only as curiosities ten years since, but they now form regular articles of commerce. They are of a very irregular shape, branching out sometimes like fingers. Their length seldom exceeds two inches; they are rarely more than a quarter of an inch in diameter at the base, where they spring from the tree, but they spread out as much sometimes as an inch and a half to two inches. When broken, they are found to consist of a thin shell, not thicker than a walnut-shell, of a dark-yellowish or reddish-brown colour internally, and semi-transparent; but externally they are covered with very fine down, and consequently look like the young horns of a stag when just budding. They are produced on the *Rhus semi-alata* (see SUMACH), by an insect not yet known to science. Since the Japanese ports have been opened to British commerce, considerable imports of these curious galls have been received from that country. They are rather more branched, the branches or lobes being smaller than in the Chinese variety, but in all other respects they are identical.

A very great many galls are known in most parts of the world, and in our own country the oaks yield numerous species, but those above enumerated are the galls of commerce: few others have ever been found to pay the expense of collecting. Galls are extensively used in dyeing, chiefly for the production of black colours, with logwood and the salts of iron, either for dyeing in the piece, or printing patterns; in each case, the material is first submitted to the action of a solution of the galls, and afterwards to another of the dye-wood and iron salt. They are also an important constituent in writing-ink (see

INK), and are used in tanning the finer kinds of fancy leathers.

GALL-STONE. See CALCULUS, BILIARY.

GALOCHES. See GOLOSHES.

GALT, JOHN, a distinguished Scottish novelist, was born in Irvine, on the 2d May 1779. His father, who was a captain of a ship in the West Indian trade, left Ayrshire in 1780, and fixed his residence in Greenock. In that town, G. received his education, and was then placed in the custom-house. He remained there till 1804, when, panting after literary distinction, he proceeded to London with an epic poem on the battle of Largs in his portmanteau. On reaching the metropolis, he printed his epic, but becoming dissatisfied with its merits, he ultimately withdrew it from the market. After a few years, his health began to fail, and he was obliged to seek relief in a more genial climate. At Gibraltar, he made the acquaintance of Lord Byron—flushed with his first success in the *English Bards and Scotch Reviewers*—and his friend Mr Hobhouse, and the three travellers became fellow-voyagers. Separating from his new friends, G. visited Sicily, then Malta, and finally repaired to Greece, where he again renewed his acquaintance with Byron, and had an interview with Ali Pacha. He then proceeded to Constantinople, and afterwards to the shores of the Black Sea. On one occasion, when detained by quarantine, he sketched six dramas, which were afterwards given to the world. On his return, he published *Letters from the Levant* with considerable success, but first displayed the possession of distinct and individual power in *The Ayrshire Legatees*, which was published in *Blackwood's Magazine* in 1820. *The Annals of the Parish*, a far superior work, appeared the year after, and met with unquestionable success. Having hit on the true vein, he worked it assiduously, and produced *Sir Andrew Wylie*, *The Entail*, *The Steam-boat*, and *The Provost*, with great rapidity. He then diverged into the walk of historical romance, and published *Ringan Gilhaize*, a tale of the Covenanters; *The Spaewife*, *Rothelan*, and *The Omen*. These works, although full of striking scenes, and abounding in powerful writing, were not so successful as his earlier and less ambitious performances. G., whose hands were always equally full of literary and commercial undertakings, was now busily engaged in the formation of the Canada Company; but before he left England for his distant scene of labour, he gave to the world *The Last of the Lairds*.

He departed for Canada in 1826, but, disappointed in his expectations, he returned to England in the course of a year or two, and recommenced his literary labours with his usual rapidity. In a short time, he published a novel, *Lawrie Todd*, which was followed by *Southennan*, a romance of the days of Queen Mary; and this by a *Life of Lord Byron*, which ran through several editions, but which was roughly handled by the critics. In 1834, he published *Literary Miscellanies* in three volumes. He now returned to Scotland, utterly broken in health and spirits; and after suffering several attacks of paralysis, he expired at Greenock on the 11th of April 1839.

G. was a voluminous and unequal writer; but while several of his productions are already forgotten, others of them will perish only with the language. In depicting provincialism, in representing life as it flows on in small towns and villages—communities in which the successful shopkeeper may aspire to be the chief magistrate, and in which the minister is the most important personage—he is without a rival. He has founded a school of writers in Scotland, but as yet his followers have produced no work equal to *The Provost* or *The Annals of the Parish*.

GALT, a thriving town in the county of Waterloo, Canada West, principally built of stone. It stands on both sides of the Grand River, about 55 miles from its entrance into Lake Erie. The eastern and western parts of the town are connected by two wooden bridges, resting on massive stone piers. The environs of the town are noted for their beauty. The first house of G. was built in 1816, amid a dense forest of pines, which then covered its site. The inhabitants now number about 4000, the majority being of Scotch descent. It contains ten places of public worship, four being Presbyterian, three Methodist, one Episcopal, one Roman Catholic, and one Baptist; the last-named belongs to the coloured population. It supports one grammar and one common school: the average attendance at the latter being about 500; and has an extensive library and public reading-room in connection with a mechanics' institute. Among its industrial establishments are several woollen manufactories and iron foundries. The manufacture of edge-tools is carried on to a large extent. The trade of the town is greatly promoted by the Great Western Railway, a branch of which passes through Galt. The local affairs of G. are managed by a mayor and council of fifteen members.

GALVA'NI, LUIGI, a famous physician and anatomist, was born at Bologna, 9th September 1737. At an early age, he evinced a strong inclination to devote himself to a monastic life, and his studies in the university of Bologna were, with this view, chiefly directed to scholastic philosophy, rather than to general science. Swayed, however, by the persuasion of his friends, he relinquished his intention of entering the church, and determined to follow the profession of medicine, selecting for special investigation the departments of physiology and comparative anatomy. At this time, he enjoyed the benefit of studying under some of the most eminent medical professors of the day—Beccaria, Tacconi, and Galeazzi, whose talented daughter he subsequently married. So distinguished by his knowledge and ability did he soon become, that in 1762 he was elected professor of anatomy in the institute of his native city, when his lectures, although not remarkable for eloquence, were clear, accurate, and comprehensive, and enjoyed much popularity. His writings are not numerous, but all contain valuable scientific matter, and are characterised by a rare precision and minuteness of details. Two treatises, which added considerably to his reputation, are—*Considerations on the Urinary Organs*, and *On the Organs of Hearing of Birds*. But to a purely casual discovery G. owes the wide celebrity attached to his name. Many versions of this circumstance have obtained credence; but the simple fact seems to be, that G.'s wife, a woman of penetrating intellect, happened one day to witness with surprise the convulsive muscular movements produced in a skinned frog by its inanimate body having been accidentally brought into contact with a scalpel which lay on the table, and had become charged by contact with an adjoining electrical machine. She hastened to communicate the interesting phenomenon to her husband, who at once instituted a prolonged series of experiments. See GALVANISM, and ELECTRICITY, ANIMAL. G. died 4th December 1798. Some time previously, he had lost in his wife a cherished companion, and was deprived of all his public emoluments, in consequence of his refusal to take the oaths prescribed by the Cisalpine Republic, of which Bologna then formed a part. His writings have been chiefly published in the memoirs of the Bologna Institute of Sciences, including the most remarkable production of his pen, the treatise entitled *De Viribus Electricitatis in Motu Musculari Commentarius.*

GALVANI'SED IRON. This name is given to plates of iron coated with zinc, without any reference, as its name would imply, to galvanism. Most probably, it was applied by its French inventor for the special purpose of misleading, and for concealing the real nature of the manufacture.

The value of giving a thin coating to iron, of some easily fusible metal much less liable to oxidation than itself, has been long known and acted upon, as in the case of tinned iron, or tin, as it is commonly called; but this could not be applied on a very large scale, such as for roofing, or for large iron structures, such as have of late been extensively erected for various purposes.

It is not known exactly when zinc coating was first used in France, where it was invented; but the first English patent was taken out in 1837 by Mr H. W. Crawfurd, who applied it chiefly to sheets of corrugated iron, or sheet-iron, bent by a peculiar process into alternate semicircular elevations and depressions; and this soon became extensively employed for roofing purposes, especially for railway sheds, which were then beginning to be in great request.

The process employed by Mr Crawfurd was first to remove the rust and scale from the iron, by immersing it in dilute sulphuric acid, either hot or cold; but the former state was preferred; and for this purpose the acid was kept warm in a large leaden bath, sunk in the ground for easier access. After the sheets or other articles of iron have been acted upon by the acid for a few minutes more or less, according to their requirements, they are plunged into cold water, to remove the acid, and afterwards scoured with sand, and again washed clean with water. The iron being now ready to receive its coating of zinc, it is plunged into a bath of that metal, which, previous to its being melted, is coated with a thick layer of dry sal-ammoniac (hydrochlorate of ammonia); this melts also, and forms a viscid coating over the metal, which prevents that rapid oxidation to which the molten metal is otherwise liable. The bath itself is constructed of fire-clay, and, in some of the large works visited by the writer, contains, when fully charged, from a ton and a half to two tons of molten zinc. The iron is simply dipped into the zinc bath, or made to pass through, and when pulled out is effectually coated.

The enormous demand which has arisen for galvanised iron, especially in the form of sheets, telegraph wire, and bolts for ships, has led to improvements in its preparation; these have been chiefly, however, in the application of machinery to aid the workmen.

Muriatic acid, as well as sulphuric acid, is extensively used in the *pickling* or first process, and for the coarser materials the scouring with sand is usually dispensed with. The sheets are made to pass between two iron rollers in the zinc bath, and are thus more easily drawn through and kept perfectly smooth. Ships' bolts, nails, screws, chains, &c., are dipped in, in bundles, or in the case of nails, &c., in iron strainers; when removed, the zinc makes them adhere together; and to effect their separation, they have to be placed in a crucible with powdered charcoal, in which they are heated to redness, and repeatedly shaken as they cool; by this means, they are easily separated.

The important article of telegraph wire, of which the single firm of Messrs Johnston & Co., Manchester, annually turns out some thousands of miles, is managed entirely by machinery. The iron wire is brought from the drawing-mill, and after pickling in dilute muriatic acid, is passed through a pipe kept at white heat by passing through a furnace; this furnace having a row of such pipes set like the tubes of a boiler, but all at the same level, and open at each end, so that the wire has a clear passage through. The machinery being started, the wire is slowly drawn through, and becoming red hot in the pipes, is immediately deflected downwards into the zinc bath between grooved rollers, whence it rises, and is drawn forward; and by the time it is sufficiently cooled, reaches the coiling reels, and is made up into coils ready for use.

There is a variety of galvanised iron called *galvanised tinned iron.* This was introduced by Messrs Morewood and Rogers, who combined several patents to complete their process, which is as follows: A large wooden bath, sufficiently large to hold the largest sheets of iron, is prepared, and the sheets or other articles, after being pickled, and scoured, and washed, as in the usual process, are transferred to it. On the bottom of the bath is first placed a layer of finely granulated zinc, then a sheet of the iron, then another layer of granulated zinc, and so on as far as convenient; and the bath is filled up with a diluted solution of muriate of tin, of the strength of two quarts of the muriate to three hundred gallons of water. The alternate arrangement of zinc and iron constitutes a sort of galvanic battery, which is called into activity by the liquid, and a thin deposit of tin takes place all over the iron, which process is usually completed in about two hours. The plates are then removed from the bath, and after being drained for a short time, are taken to the zinc bath prepared exactly as in the ordinary process, where they are dipped or passed through the rollers. By this process, a very even deposit of zinc is produced, which in cooling, crystallises all over the surface very beautifully; but it is too expensive for the ordinary purposes to which galvanised iron is applied.

Experience has shewn that this material cannot always be used economically; the action of steam upon it produces very rapid decomposition; therefore it is particularly unsuitable for railway stations or sheds under which the locomotives stand and discharge their steam. It was extensively employed for public urinals in Liverpool, and so rapid was their decay, that at the end of three months hardly one was left standing. But if not exposed to a certain class of deleterious chemical influences, it is by far the most economical means of employing iron for covering buildings, as it requires no paint, and withstands the action of the atmosphere for a very considerable length of time.

GA'LVANISM is that branch of the science of electricity which treats of the electric currents arising from chemical action, more particularly from that attending the dissolution of metals. It is sometimes called Dynamical Electricity, because it deals with current electricity, or electricity in motion, and is thus distinguished from Frictional Electricity (q. v.), which is called Statical in consequence of its investigating the electric condition of bodies in which electricity remains insulated or stationary. These terms, although in the main thus properly applied, are in all strictness applicable to both sciences. Frictional electricity, though small in quantity, can pass in a sensible current, and galvanic electricity, though small in tension, can be made to manifest the attractions and repulsions of stationary electricity. Thus the series of discharges which are transmitted in a wire connecting the prime conductor of a machine in action with the ground, possesses, though feebly, the characteristics of a galvanic current; and the insulated poles of a many-celled galvanic battery, manifest before the current begins the electric tension of the friction machine. The other branches of current electricity will be found under INDUCTION OF ELECTRIC CURRENTS, MAGNETO-ELECTRICITY, and THERMO-ELECTRICITY.

Historical Sketch.—The science of galvanism dates from the close of the 18th century. In the year 1780, Galvani, in making investigations on the nervous irritability of cold-blooded animals, discovered by accident that the limbs of a recently killed frog, when hung by the crural nerve on a metal support near an electric machine, contracted convulsively at the recurrence of each spark. This he properly accounted for by the back-stroke. See ELECTRICITY. Six years afterwards (1786), in experimenting on atmospheric electricity with frog limbs as delicate electroscopes, he obtained, also accidentally, the same convulsions by bringing the copper hook on which the nerve hung, and the limb itself, simultaneously in contact with an iron railing. The similarity of the result led him to attribute it to the same cause—viz., electricity either existing in the limb itself or produced in the conducting arc of metal. On consideration, he adopted the former hypothesis, and looked upon the limb as a self-charging Leyden jar, with the nerve as the brass knob and wire; the interior of the muscle as the inner coating, its exterior the outer coating, and the metal arc as the discharging tongs. See ELECTRICITY, ANIMAL. He first published his researches in 1791. Volta, 1792, discarded the account given by Galvani of his experiment; and from the fact that the convulsions in question took place with more energy when there were two metals in the conducting arc instead of one, attributed the source of electricity to the heterogeneity of the metals employed. He maintained that at the surface of contact of two different metals an electric force arising from their heterogeneity is generated, which throws them into different tensions. This doctrine forms the fundamental principle of the *contact theory* of galvanism. In reply to Volta, Galvani proved incontestably that the contraction in the limbs of the frog took place when only one metal was employed, and even when the conductor was not of metal at all. Subsequent discovery has proved Galvani to be partly right in attributing the cause of these convulsions to animal electricity, and Volta also to be partly right in attributing them to electricity generated in the metal arc, for both causes may be at work in producing the result. Volta's theory of contact is now, however, generally considered erroneous, and a *chemical theory* better attested by experiment has been originated, which attributes the source of galvanic electricity to the chemical action of a liquid on a metal coupled with another metal less easily acted on than itself. Fabroni, a professor at Florence, was the first (1792) to suggest chemical action as one of the causes at work in Galvani's experiment. Volta did not accept of Galvani's vindication, but supported his theory by several apparently conclusive experiments. In 1799, he constructed, as the crowning evidence of the truth of his reasoning, his pile, and with it properly begins the history of galvanism. To Galvani is thus due the merit of discovering a new manifestation of electricity; to Volta is due the merit of displaying in it a source of power of incalculable importance, and which, but for his genius, might have remained among the barren curiosities of science. Hence it becomes a question of some difficulty to decide to which of the two the science we are discussing owes its origin—whether it is to be called Galvanism or Voltaism. Priority of discovery has led men generally to decide in favour of Galvani, although Volta has almost equal claim to have his name attached to the science.

The first account of Volta's pile reached England in a letter to Sir Joseph Banks by the inventor (1800). A few weeks afterwards Carlisle and Nicholson decomposed water with it, and afterwards several salts. They were the first to use platinum electrodes. Davy, in the same year, traced the electricity of the pile to chemical action. Wollaston (1801) reiterated the same theory, and went the length of attributing even frictional electricity to chemical action. He proved likewise the identity of the two electricities, and shewed that by diminishing the electrodes to mere points, the electricity of the machine could produce the same chemical effects as that of the pile. In 1802, Cruikshank improved the construction of the pile by disposing the plates horizontally in a trough instead of vertically in column. The main features of electro-chemical decomposition were discussed by Davy in his famous Bakerian lecture of 1806. In 1807, the same philosopher obtained, for the first time by galvanic agency, the metals potassium, sodium, barium, strontium, calcium, and magnesium. Deluc (1809) first made dry piles of gold and silver paper, and these were altered and improved by Zamboni (1812). In 1813, Davy discovered the electric light and voltaic arc (see ELECTRIC LIGHT) by means of the colossal battery then placed at his disposal at the Royal Institution. Œrsted (1820) first observed the action of the current on the magnetic needle; and, a few months afterwards, Ampere discovered the law of this action, and originated an electric theory of magnets which has proved wonderfully fertile in practical results. In the same year Schweigger invented the galvanometer. In 1825, Becquerel, with the aid of his differential galvanometer, investigated the conductibility of metals. Kemp, in 1826, first used amalgamated zinc for the galvanic battery. In 1827, Ohm gave a mathematical theory of the pile, rigidly deduced from Volta's fundamental principle, and in perfect keeping with experiment. Faraday (1831—1832) published his discoveries of the induction of electric currents, and of the evolution of electricity from magnets, which have since enriched the science with the Induction Coil (q. v.) and the Magneto-electric Machine (q. v.). This distinguished electrician discovered (1833—1834) the definite nature of electro-chemical decomposition, and proved that electro-chemical and chemical equivalents were identical. In 1836, Daniell constructed his constant battery. Spenser in England, and Jacobi in Russia, made, simultaneously (1837), the discovery of electro-metallurgy. Grove (1839) constructed his nitric-acid battery. Faraday (1840) proved, apparently beyond dispute, the truth of the chemical theory. Smee's battery dates also from this year. In 1843 Wheatstone, by means of his rheostat and resistance coils, investigated the resistances offered by various conducting substances to the current. In the same year Bunsen introduced his carbon battery.

The rivalry which has all along existed between the advocates of the chemical and contact theories has been highly conducive to the advancement of the science, each party calling in the aid of invention and discovery to support the truth of their statements. Among the more distinguished contact-theorists may be mentioned Volta, Ritter, Pfaff, Biot, Deluc, Ohm, and Fechner; and among the chemical theorists, Fabroni, Davy, Wollaston, Parrot, De La Rive, and Faraday. Davy latterly maintained a theory of distribution and equilibrium of electricity midway between the two, which numbered among its supporters Jæger, Berzelius, Ermann, and Prechtl.

Galvanic Pair.—When two plates of copper and amalgamated zinc (zinc whose surface has been rubbed over with mercury) are placed in a vessel (fig. 1) containing water to which a small quantity of sulphuric acid has been added, so long as they are kept from touching, either within or without the liquid, they remain apparently unaffected. If, however, they be made to touch, bubbles of hydrogen gas are formed in abundance at the copper plate, and their formation continues until the plates are again separated. If the contact be maintained for some time, and the plates and liquid be afterwards examined, it is found that the copper plate weighs exactly the same as before, that the zinc plate has lost in weight, and that the liquid contains the lost zinc in solution in the form of the sulphate of that metal. The contact need not be affected by the plates themselves. If wires of copper, or any other conductor of electricity, be soldered to the plates, or fixed to them by binding screws, and be made to touch, the changes just mentioned take place as if the plates were in contact. When the wires are thus joined, and so to speak, form one connecting wire between the plates, they exhibit very peculiar properties. If a portion of the connecting wire be placed parallel to a magnetic needle, and the needle brought near, its north end no longer points to the north, but to a point either to the east or west of it, and this deviation ceases with the separation of the wires. It is not even necessary that the wires be in contact, for if their ends be put into a vessel containing a conducting liquid, the same changes occur, though to a diminished extent, the contact being completed through the liquid. The ends of the wires, when so immersed, shew strong chemical affinities. If the conducting liquid were a solution of the sulphate of copper, the wire from the zinc becomes coated with the copper of the solution whilst the other attracts its oxygen and sulphuric acid, and wastes away in entering into combination with them. The connecting wires are found, therefore, in actual or virtual combination, to possess very marked magnetic and chemical properties. The arrangement just described constitutes a *galvanic pair*, which may be generally defined to be *two dissimilar conducting plates immersed in a liquid which can act chemically on one of them, and capable of being placed in conducting connection;* and the properties just referred to, form the characteristic powers of galvanic electricity. These properties arise from the wires in connection being the seat of a constant discharge or flow of electricity, for they are possessed, though to a very feeble extent, by the electricity of the friction electric machine. If the prime conductor of a powerful electric machine (see Electricity) be connected with one of the binding screws of an insulated galvanometer, and a wire connected with the ground be fixed into the other, the plate on being turned causes a current of electricity to pass from the machine to the ground through the coil of the galvanometer, the needle of which will then shew a deviation of one or two degrees. The deviation, so far as direction is concerned, is the same as that which would be produced by placing the wires coming from the copper and zinc respectively in the same binding screws as those connected with the machine and the ground. This would indicate that the copper plate stands electrically in the same relation to the zinc plate as the prime conductor of the machine to the ground. The electricity of the conductor is positive, and that of the ground by induction negative; so that in the galvanic pair the copper plate, by analogy, gives off positive electricity, and the zinc plate negative. Again, let the wire from the machine end in an insulated vessel containing a solution of the sulphate of copper, and let the end of a fine platinum wire connected with the ground be made to dip below the surface of the solution, and let the machine be kept in action so as to send a current of electricity through the wires and liquid, at the end of some minutes the point of the platinum wire will be covered with a minute quantity of copper. The wire connected with the zinc in the galvanic pair and that connected with the ground, are thus shewn to display the same chemical power; and this, again, shews us that the zinc plate, like the ground in the above experiment, is the seat of negative electricity. The electric condition of the plates before contact reveals, with the aid of the condenser, the presence of positive electricity in the copper plate and negative in the zinc plate. If the wire joined to the zinc plate, or as we may write it shortly, zinc wire (not, however, necessarily a zinc wire), be connected with the ground, and the insulated copper wire be made to touch the lower plate of a condenser whilst the finger touches the upper, on both being withdrawn, the leaves of the electroscope diverge with the positive electricity sent to it from the copper plate. It can be shewn, moreover, that the current is not confined to the connecting wire, for if a magnetic needle be suspended between the plates when they lie north and south, slightly above the surface of the liquid, it will deviate from its usual position when the wires are joined, and in the opposite way to that which it shews when held above the wire placed in the same direction. The current thus passes within the liquid from the zinc to the copper the opposite way to that in which it runs in the connecting wires, so that it makes a complete circuit. Hence we may conclude, generally, that *in the galvanic pair a current of electricity runs within the liquid from the chemically active to the chemically passive plate, and without the liquid, from the chemically passive to the chemically active plate, making a complete circuit;* and that if the connection be interrupted the pair shews electric polarity, the *chemically passive plate being the positive pole, and the chemically active plate the negative pole.*

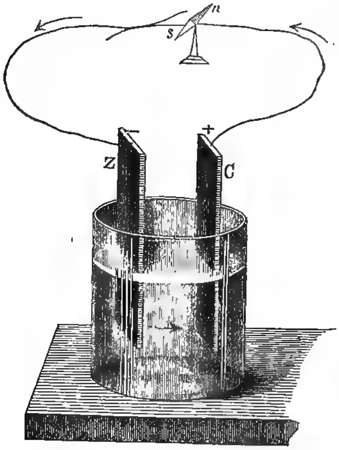


Fig. 1.

The theory of the action of the galvanic pair may be thus given. When the two plates are put into the water and sulphuric acid, they assume opposite electric states. There is developed at the surface of the zinc an electric force arising from its affinity for the oxygen of the water, which throws

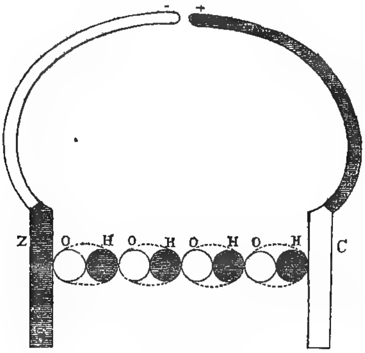


Fig. 2.

the whole arrangement into a state of polarity. This is roughly shewn in fig. 2. The zinc plate with its wire becomes polarised, shewing negative electricity at the extremity furthest from the liquid, and positive electricity at the extremity next the liquid. The copper plate with its wire is polarised in the opposite way, being positive at its outer end, and negative at its end next the liquid. The compound molecules of water (HO), consisting of oxygen (O) and hydrogen (H), are likewise polarised, but the polarisation takes place in the individual molecules. It appears, moreover, to have reference to their compound nature, and we may imagine them placed in series such as the one in the figure, with their oxygen or negative pole toward the zinc, and their hydrogen or positive pole toward the copper. The positive parts are distinguished from the negative parts in the figure by being shaded. When the ends of the wires are brought near each other, we might anticipate in these circumstances that a spark discharge, as with frictional electricity, would restore quiescence. This, however, is not the case, for the electric tension is so low that nothing short of contact can effect a discharge. When the discharge thus takes place, the polarity of the circuit for the instant ceases; the tendency to union of the zinc with the atom of oxygen next it is completed by the formation of the oxide of zinc. But in order to accomplish this, the hydrogen of the molecule of water next the zinc thus set free unites with the oxygen of the neighbouring molecule to re-form water, and the same transference and union is continued along the whole series until the hydrogen of the molecule next the copper is thrown on the copper, where, being unable to unite chemically with it, it assumes its natural gaseous state. In this way the chemical action, although only manifested at the plates, is not confined to them, but takes place throughout the liquid between all the contiguous molecules giving passage to the current. The oxide of zinc formed on the zinc plate is instantly dissolved by the sulphuric acid present in the water, leaving the plate as clean as before. After the first discharge, therefore, the whole arrangement resumes its first condition, so that a second polarisation and discharge instantly follows, which is succeeded by a third, and so on. An uninterrupted series of discharges is thus transmitted along the completed circuit, constituting what is termed a current of electricity.

Nature of the Galvanic Circuit.—In a wire where a current of galvanic or frictional electricity is passing, there is no point which forms the seat of positive or negative electricity, but it appears electrically homogeneous throughout. It exerts no statical inductive action on surrounding objects, neither attracting nor repelling them, for the electric action being more easily propagated along the wire than in any other direction, takes place only in it. The laws of induction and distribution applicable to frictional statical electricity hold true in current electricity only at the section of the wire or conductor along which the action is transmitted. As tested by the magnetic needle, there is no part of the circuit which possesses more power than another. This homogeneity gives rise to the hypothesis, that every molecule of the circuit, whether solid or liquid, acts in the transmission of the electric force, and is similarly affected in its passage. In this way the plates and connecting wires shew the same molecular polarity as the liquid, only the discharge does not effect an interchange among the molecules, but leaves them in the same condition as before. Each molecule of the connecting wire may be viewed, as in fig. 3, to be the seat of electric polarity and discharge with its negative faces turned towards the copper, and its positive towards the zinc; whenever, therefore, we go with the current, we meet each molecule on its negative side, and whenever we go contrary to the current, we meet each molecule on its positive side. Any portion of the circuit such as that represented in the figure, shews its negative face to the approaching current, and its positive face at the other extremity. A break in the connecting wire thus separates two contiguous molecules; that ending the copper wire shews itself positive, and that ending the zinc wire negative. This is in perfect keeping with experiment, for wherever a break or change of medium is made in the circuit without stopping the current—as in the electric light, chemical decompositions, the visible passage of electricity in vacuous tubes, and the like—the ends or poles exhibit opposite powers, from the pole meeting the current discharging negative, and the other positive electricity. The polarity displayed at such interruptions, or visible passages of the current, is necessarily different from the polarity of frictional electricity, for the dynamical manifestation of electric force cannot be the same as the statical; in the same way that motion, for instance, the dynamical manifestation of the force of gravity is essentially different from weight, its statical manifestation. Within the galvanic pair itself the same polarity is shewn; the zinc plate, without the liquid or the wire connected with it, is found to act as a negative pole, and the similar copper plate and wire as a positive pole; but within the liquid of the cell, the zinc plate shews the same chemical affinities as the exterior positive pole, and the similar copper plate acts as the exterior negative pole. The terms positive and negative poles are merely relative, for every molecule or series of molecules would thus appear to have its opposite poles. They serve, however, conveniently to express the relations of two consecutive parts of the circuit. Considerable confusion sometimes arises from speaking of the zinc plate as at once the positive element and negative pole, and the copper the negative element and positive pole of the galvanic pair, and such expressions seem even inconsistent. The truth is, that the zinc and copper plates must have each both poles from the very nature of the circuit; but as the outer poles only of these plates are of

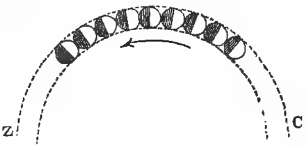


Fig. 3.

practical importance, these are considered to be the poles.

According to the one-fluid theory of electricity, a force is developed at the seat of the action, which has the power of liberating the electric fluid, and of maintaining it in motion throughout the circuit, constituting a current in the true sense of the term. According to the two-fluid theory, two such currents, one of the positive the other of the negative fluid, are made to move in opposite directions throughout the circuit. The propelling force is consequently termed *electro-motive*, and the galvanic pair is called the *electromotor*. The terms current and electro-motive have their origin in the supposed fluidity of electricity, but being quite definite in their application, they may be used without any such admission. A current—or, according to the two-fluid theory, a positive current—may be taken to signify, apart from all supposition, simply the peculiar electric condition of the conductor, which forms the line of discharge between a positive and a negative source of electricity, and electromotive force may be used simply to denote that which propagates and maintains this discharge. In the same way, when we speak of the direction of the current, we only use a convenient way of shewing at which end the positive and negative electricities arise, the current being always represented as moving from the positive to the negative. The greater the electromotive force is, the more powerfully is the discharge effected, and the more is it able to force its way through imperfect conductors. The measure, therefore, of electro-motive force is the tension of the electricity which it generates.

Origin of Galvanic Electricity.—It is now generally admitted that the source of the electro-motive force in the galvanic pair is the chemical action which takes place at the zinc plate. It must appear, even to the most cursory observer, highly probable that the seat of the most active change going forward in the pair is likewise the origin of the force accompanying it. It is found, moreover, when we tax the galvanic current with electro-chemical work, that the amount of work done by it is exactly proportionate to the quantity of zinc dissolved. These and similar considerations seem to argue strongly that galvanic action has its source in chemical action. Volta, however, and several of the most eminent authorities in the science, maintain that the electromotive force has its seat at the surface of contact of heterogeneous metals, and that chemical action is not the cause, but the manifestation of it. This view of the origin of galvanic electricity is called the *contact theory*, as distinguished from the *chemical theory*, the one we have hitherto followed. The contact theory supposes that at the surfaces of contact of two heterogeneous substances, an electromotive force, invariable in direction and amount, is generated and subject to modification only by the resistance offered by the conducting circuit. The galvanic pair (fig. 1) is accounted for by this theory in the following way. Let us suppose, for the sake of explanation, that both zinc and copper plates are connected by copper wires. The seat of electromotive force is at the junction of the copper wire with the zinc. At this point the two metals assume opposite electricities—the copper the negative, and the zinc the positive; and since a conducting circuit through wires, plates, and liquid is established, these electricities travel in opposite directions, and, meeting, neutralise each other within the liquid, to give place to succeeding similar discharges of electricity. The discharge within the liquid takes place electrolytically. The theory is, in this case, sufficient and consistent, but it must be kept in mind, that in a circuit so perfectly homogeneous, the source of force may be placed anywhere without altering its conditions. The fundamental evidence of the contact theory consists in an experiment like the following: A piece of zinc is made to touch the lower brass or copper plate of a condenser, while the finger rests on the upper. After the zinc and finger are removed, and the upper plate lifted, the gold leaves diverge with negative electricity. Here the mere contact of metals appears to give rise to electricity. The positive electricity of the zinc goes to the ground, and the negative electricity of the copper is insulated in it—the electro-motive force originating at the surface, where the copper and zinc meet. If this experiment were capable only of this interpretation, it would be decisive of the question at issue. It is found, however, that in order to succeed well with it, the fingers must be moist, and that no electricity can be obtained if it be conducted in a gas where no free oxygen is present—such as nitrogen or carbonic acid. Hence it appears, that even in the testing experiment of the contact theory, where it is supposed that contact alone can give any explanation, chemical action, arising from the sweat of the fingers and oxygen of the air acting on the zinc, is present. Faraday's experimental researches seem to place beyond dispute the truth of the chemical theory. We shall here quote two of his many beautiful experiments illustrative of the subject, which are of themselves quite convincing. Let (fig. 4) A and B be two glass vessels containing sulphuret of potassium. Two platinum plates, P and P′, are put into the vessel A, and an iron plate F, with a platinum plate P″ in B. To the platinum plate P′ a platinum wire *p*, and to the iron plate F an iron wire *f*, are attached. From P and P″, wires proceed to the galvanometer G. The sulphuret of potassium is, for a liquid, a good conductor of electricity, but is chemically inactive when associated with platinum and iron in a circuit. When the wires *p* and *f* are joined, if an electro-motive force were developed at their surface of contact, all the conditions necessary for a circuit being present, a current would be generated, which would deflect the needle of the galvanometer. This last, however, gives not the slightest evidence of a current. If zinc be interposed at the junction of *p* and *f*, the galvanometer is equally unaffected; but if a piece of paper moistened with sulphuric acid be placed between the ends of these wires, a decided deflection ensues, and the iron becomes the positive element of a platinum-iron pair. We have thus conclusive evidence, that the simple contact of the iron and the platinum is unattended by electro-motive force, and that this is developed only by the chemical action upon the iron of an interposed liquid. Again, into one of the vessels just referred to, let two plates, one of copper, the other of silver, be placed, and let communication be established between them and the galvanometer. The needle at first deflects briskly in a direction which shews that the copper is the positive element

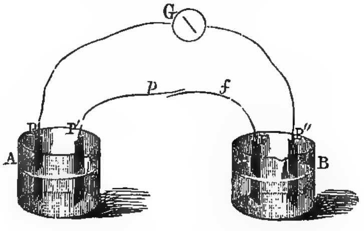


Fig. 4.

of the pair, it then gradually returns to its first position, and again deflects in the opposite direction; shewing that the silver is now the positive element. After some time it returns, and again deflects in the original direction, and goes on thus changing. If the plates be examined during these changes, it is observed that sulphuret of copper is formed when the copper is positive, and sulphuret of silver when the silver is positive; the alternate action being attributable to the relative condition of the plates when coated with their sulphurets. The electromotive force of a silver copper pair is thus shewn to be not invariable in direction as the contact theorists maintain; but to change its direction with the seat of chemical action.

Chemical conditions of the Galvanic Pair.—We have hitherto supposed that, in the galvanic pair, the zinc alone had affinity for the oxygen of the water, but chemistry teaches us that copper likewise has the same affinity, though to a less degree. Hence we must conclude that there originates at the copper an electro-motive force acting contrary to that of the zinc; and that the electro-motive force of the pair is the difference of these opposing forces. Were we to take two similar plates of zinc instead of one of zinc, and the other of copper, we should thus have two equal forces tending to propel two equal currents in opposite directions. In this case the two forces would equilibrate each other, and electrical and chemical inaction would be the consequence, a conclusion quite in keeping with experiment. It therefore becomes necessary to couple the zinc with a metal such as copper, less oxidable than itself. In keeping with this theory, it is found that if the zinc be coupled with a metal less oxidable still than copper, the resultant electromotive force is increased. A pair consisting of zinc and silver gives an electricity of higher tension, and consequently a more powerful current than one of zinc and copper, and one of zinc and platinum a stronger current still; silver being less oxidable than copper, and platinum less than silver. As zinc forms the principal element of expense in maintaining the current, a platinum-zinc pair is more economical than either of the other two just named, because, for the same quantity of zinc dissolved, it gives the best electrical result. The greater, then, the disparity in oxidability, or in liability to be affected by the exciting liquid of the metals of the pair, the greater is its power.

In the galvanic cell we have found that not only the metals, but likewise the elements of the liquid, act as if they assumed opposite electricities. The zinc is positive with reference to the copper, and the hydrogen stands in the same relation to the oxygen. In the 'Electro-chemical order of the Elements' (q. v.), the elements are approximately arranged according to the part they would play if associated in a galvanic pair, beginning with potassium, the most electro-positive,* and ending with oxygen, the most electro-negative; each being positive to the one succeeding, and negative to the one preceding it. Chemically speaking, electro-positive has much the same meaning as oxidable. We may here repeat the more common elements in the same order: Potassium, sodium, magnesium, zinc, iron, lead, copper, silver, platinum, hydrogen, carbon, chlorine, sulphur, oxygen. If it were proposed to ascertain from this list the action of a platinum-iron pair immersed in a solution of hydrochloric acid (HCl), we should proceed to argue thus: Iron, preceding platinum, is positive in relation to it. Chlorine succeeds hydrogen, and is relatively negative. Chlorine, the negative element of the liquid, would accordingly be discharged at the electro-positive iron, and the proto-chloride of iron ($FeCl$) would be formed. The electro-positive hydrogen would be disengaged at the electro-negative platinum. The interpolar current, consequently, proceeds from the platinum to the iron. If, however, no chemical affinity existed between iron and chlorine, no electricity would be generated, as chemical is essential to galvanic action. From such a list alone we cannot predict the result of any supposed combination. The metals themselves, as we have already seen, frequently change their relative positions, according to the action of the liquid in which they are put, so that the order given is by no means absolute. The electro-negative plate remains in presence of the electro-positive totally unaffected, and more so than if it were placed by itself in the exciting liquid. Hydrochloric acid, for instance, readily attacks iron; but if a piece of zinc be put into the liquid, and be made to touch it, the iron will remain untouched until the zinc has been first dissolved. Wherever, therefore, iron is exposed to corrosive action, it may be protected from it by coupling it with zinc. This accounts, in some degree, for the durability of iron coated with zinc, or, as it is called, 'Galvanised Iron' (q. v.). In the same way zinc protects copper from corrosive action. On the other hand, zinc corrodes more readily in presence of these metals, and hence the necessity for using zinc nails for zinc roofs instead of iron or copper nails. When pure zinc is put into dilute sulphuric acid, almost no change is visible, whilst ordinary commercial zinc is rapidly dissolved by it. This arises, in all probability, from different portions of the latter standing in different chemical relations, arising from the heterogeneous structure introduced by extraneous substances. Galvanic pairs are thus established within the metal, and the metal dissolves in consequence. In a designed galvanic pair, *local* circuits would thus be formed at different parts of the zinc plate, which, besides occasioning a useless waste of the metal, would lessen the strength of the main circuit, were it not found that amalgamated zinc possesses the properties of the pure metal.

Quantity and Tension of Electricity.—It is found that the tension of the electricity of a galvanic pair, as tested by the amount of divergence of the gold leaves of a condensing electrometer, is not increased by increasing the size of the plates. For the same pair, therefore, metals and liquid included, the electro-motive force is constant whatever be the active surface. Although the tension is not increased, the quantity of electricity transmitted in the current is increased. If the interpolar communication of the two plates be made by a good conductor, such as a thick copper wire, the power which the current has to deflect the magnetic needle is doubled when we double the surface exposed to the action of the liquid. The thick wire offers no resistance to discharge, and the tension of the electricity given off in the two cases is not put to proof. The quantity of electricity is shewn thus to increase with the surface of the plates. The distinction between electricity of quantity and electricity of tension is well illustrated in comparing the electricity of the galvanic pair with that of the machine. A Winter's electric machine, such as the two-foot plate described in the article ELECTRICITY, gives readily, when in good order, a spark of twelve inches, and causes a visible disturbance of the leaves of an electrometer at a distance of 20 feet from it. If such a machine be made to send a current through a moderately sensible galvanometer in the way described at the beginning of the article, it will make the needle deflect one or two degrees. If a galvanic pair be connected with the same galvanometer, consisting of very fine iron and copper wires about an eightieth of an inch in diameter, immersed for about an inch into a few ounces of water containing one drop of sulphuric acid, the needle will deflect three or four times what it did before. The electricity of the current produced in the diminutive pair is greater in quantity than that of the machine, but its tension is immeasurably smaller. Should a break be made in the circuit, the power of the terminal poles to attract or repel is almost infinitesimal, and discharge between them through the air cannot be effected even at a microscopic distance. The electricity given off by the machine is small in quantity, but exalted in tension. Could the electricity of the machine have the quantity of that of the pair, or could the electricity of the pair be endowed with the tension of the machine, a current of tremendous power would be the result. The tension of electricity is generally estimated, previous to discharge, by its power of attraction and repulsion, and the quantity, during discharge, by its chemical and magnetic effects.

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* According to Bunsen, the new metal, caesium, is the most electro-positive substance yet known.

Galvanic Battery.—When a number of copper and zinc pairs, similar to the one already referred to, are put together, so that the copper plate of one cell is placed in conducting connection with the zinc plate of the next, in the manner shewn in fig. 5, they constitute a galvanic battery. The term battery is sometimes also applied to a number of cells acting as one combination, in whatever way they may be connected. When the terminal copper and zinc plates (fig. 5) are connected, the current runs from each copper to each zinc plate without the liquids, and from each zinc to each copper plate within the liquids; and when the contact is broken, the zinc pole shews negative, and the copper pole positive, electricity. The galvanic battery acts thus in all respects as a compound galvanic pair. If the polar wires be connected with a tangent galvanometer, the deflection of the needle caused by the battery will be exactly the same as that effected by one of the cells, provided the wire be thick, and a good conductor; but if the zinc end be connected with the ground, and the electric tension of the insulated copper pole be tested by a condenser and torsion balance, its tension is found to be as many times greater than the tension of the same pole of one cell examined in the same way, as there are cells in the combination. Thus, if two cells be taken, the tension is doubled; if three, tripled; and so on. *The electro-motive force of a battery is therefore proportional to the number of cells*, supposing, of course, that they are arranged consecutively, as in the figure. Hence the electricity of a battery is better able to force its way through imperfect conductors than that of the simple pair. When the interpolar communication is formed by a thick short wire, a single cell produces as powerful an effect on the magnetic needle as a battery; but if it be formed by a bad conductor, such as a long and thin wire, or a liquid, the effect is very different. The current of the pair is then nearly stopped, and its influence on the needle small, while that of the battery continues to flow comparatively unimpaired. In the presence of considerable resistance, the quantity of electricity transmitted, or, as it is termed, the *strength* of the current, depends not only on the size of the plates of each couple, but also on the number of couples. That the electric tension should multiply with the number of cells, may be accounted for by the consideration, that instead of one polarising force, there are several, all acting in the same direction, each one exalting the polarity of the molecules produced by the other.

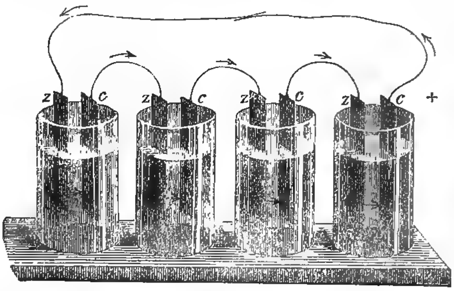


Fig. 5.

Different Forms of the Galvanic Battery.—*Volta's pile* is shewn in fig. 6. It consists of a number of circular plates, each made up of a plate of copper and a plate of zinc soldered together, built up, the copper plates facing one way, and the zinc the other, each compound plate being separated by a circular piece of woollen cloth, moistened with a solution of common salt, or dilute sulphuric acid. In consequence of the great number of pairs, the electric tension of the poles of Volta's pile is considerable. One furnished with from 60 to 100 plates can charge an electroscope without the condensing plates. It is from this battery that the term 'pile' is applied to the galvanic or voltaic battery. Volta used another form of battery, which he called a *crown of cups*. This consisted of a number of cells like those in fig. 1, arranged in a circle, so that the first and last were contiguous.

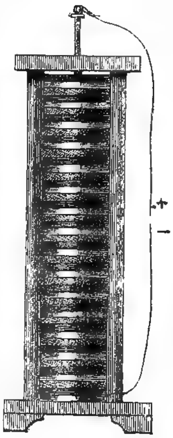


Fig. 6.

Zamboni's Dry Pile consists of several hundreds, and sometimes thousands, of discs of paper tinned on one side, and covered with binoxide of manganese on the other, put together consecutively, as in Volta's pile, and placed under pressure in an insulating glass tube closed with brass ends, which serve as the poles. The electric tension of the poles of this arrangement is considerable, but the strength of the current which passes when the poles are joined, is next to nothing. The most important application of the dry pile is in the construction of a very delicate electrometer, which is named after its inventor, *Bohnenberger's electrometer*.

The Galvanic Trough, introduced by Cruikshank, is a trough (fig. 7) into which rectangular plates of copper and zinc, like those of Volta's pile, are fixed,

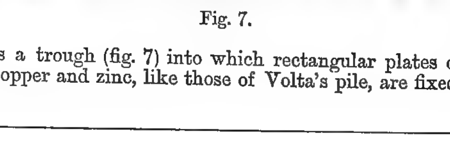


Fig. 7.

the cells included between each pair being filled with dilute sulphuric acid. The inner surface of the trough is coated with an insulating substance.

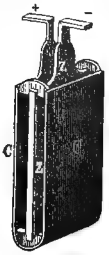


Fig. 8.

Wollaston's Battery.—Each couple of this battery (fig. 8) is made up of a plate of copper, doubled up so as to include a plate of zinc, from which it is kept apart by strips of wood. Both faces of the zinc are thus equally exposed to chemical and galvanic action, a device by which the quantity of electricity is increased. Fig. 9 shews a battery of five of these. The connecting strips of metal are fixed to a wooden rod, which allows of them being lifted or lowered together. When the battery is put in action, the whole is lowered, and the five couples are immersed in five troughs filled with dilute sulphuric acid (1 of the acid to 12 of water). When out of action, the whole is lifted and fixed by binding screws to the two supporting pillars. When the number of pairs is small, as in the figure, it is of little consequence whether one large trough or five small ones be used.

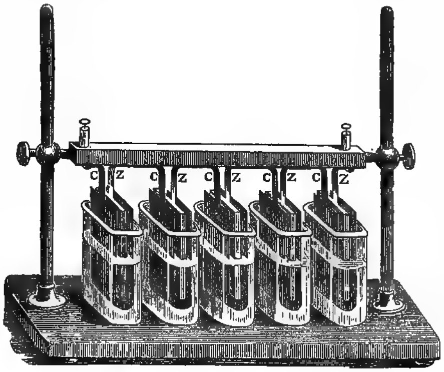


Fig. 9.

Smee's Battery.—In Smee's couple, the position of the plates of Wollaston's couple is reversed. It consists of a silver plate, with a zinc plate on either side, kept separated from it by slips of wood, the two zinc plates being fastened by a coupling. There are thus two positive plates to one negative, instead of two negative to one positive, as in Wollaston's couple, and this is found to increase still more the strength of the current produced. The silver plate is platinised—that is, covered over with finely divided platinum—and this is found to lessen the adhesion of the hydrogen bubbles to the plate, thereby greatly improving the constancy of the action. Smee's battery has the same arrangement as Wollaston's.

Grove's Gas Battery.—This battery is more intended for instruction than use. One of its cells is shewn in fig. 10. Into the two outer necks of a three-necked bottle, two glass tubes are fitted by means of corks through which they pass. Each of these tubes is open below, and a platinum wire enters them hermetically above, to which a long strip of platinum is soldered, extending nearly to the bottom of the tube. Little cups containing mercury stand at the upper ends of these wires. The whole apparatus is filled with slightly acid water, and the poles of a galvanic battery are placed in the little cups. Water is thereby decomposed: oxygen forms in the one tube and hydrogen in the other. When the battery wires are removed, no change takes place till metallic connection is established between the cups, and the oxygen and hydrogen gradually disappear, attended by an electric current which passes from the oxygen to the hydrogen. When several of these are put together in a battery, the connection being always oxygen to hydrogen, they can decompose water. The most important fact illustrated by Grove's battery is, that the oxygen and hydrogen, liberated by galvanic agency, when left to themselves, produce a current the opposite to that which separated them. When the poles of the decomposing battery were in the mercury cups, hydrogen is given off at the negative, and oxygen at the positive pole; and as opposite electricities attract, it is manifest that the hydrogen in this action is positive, and the oxygen negative. When the two gases form, by means of the platinum plates, a galvanic pair by themselves, the current must proceed, as in all cases, from the positive to the negative within the liquid, and the reverse way between the poles; but this is the opposite of the direction of the original current. It is therefore manifest that where oxygen or hydrogen is set free at any point in a galvanic circuit, they will tend to send a counter-current. This action is called *galvanic polarisation.* This accounts for the sudden falling off in strength in all galvanic couples where hydrogen is set free at the negative plate. The bubbles of the gas adhering to the plate, not only lessen the surface of contact between the plate and the liquid, but exert an electromotive force contrary to that of the pair, and this goes on increasing until the action becomes greatly reduced. In all improved forms of the pair, it therefore becomes necessary to adopt some means for preventing the disengagement of hydrogen at the negative plate, and this is done in all *constant batteries* by employing two fluids instead of *one.* The best known constant batteries are those of Daniell, Grove, and Bunsen.

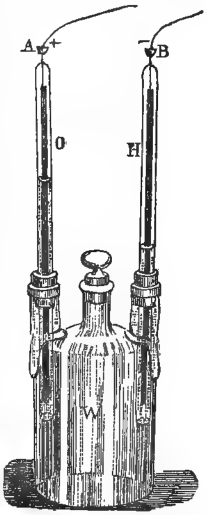


Fig. 10.

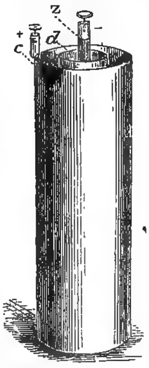


Fig. 11.

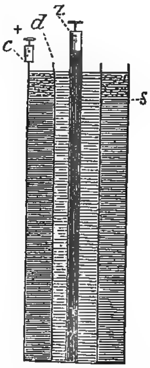


Fig. 12.

Daniell's Battery.—A cell of this battery is shewn in fig. 11, and a section of it in fig. 12. The containing vessel, *c*, is of copper, which serves likewise as the negative element of the pair. Inside of this is another vessel, *d*, of porous unglazed earthenware containing a rod of zinc, *z*. The space between the copper and the porous cell is filled with a solution of the sulphate of copper, which is kept concentrated by crystals of the salt lying on a projecting shelf, *s*, and dilute sulphuric acid is placed with the zinc in the porous cell. When a tangent galvanometer is included in the circuit, the needle keeps steadily at the same point for hours. The rationale of its action is given as follows: the porous cell which keeps the fluids from mingling, does not hinder the passage of the current; when the atoms of hydrogen that would ultimately be freed at the copper reach the porous cell, they displace the copper in the sulphate of copper, and copper instead of hydrogen is thrown on the copper plate. To give a graphic representation of this action, it is necessary to suppose that the sulphate of copper (CuO,SO_3) should be represented not as the union of oxide of copper (CuO) and sulphuric acid (SO_3), but as $CuSO_4$, the direct combination of the metal (Cu) with a salt radical (SO_4) called sulphion, and that the dissolution of the zinc does not arise from the decomposition of water, but of the compound of sulphuric acid and water (HO), regarded as the sulphionide of hydrogen (H,SO_4). Taking these letters to represent the molecules, and beginning with the copper (Cu) of the outer vessel, and ending with the zinc (Zn) of the rod, we have the arrangement before discharge, $Cu,\overline{CuSO_4},\overline{CuSO_4},]^d\overline{H,SO_4}\ \overline{H,SO_4}\ Zn$; and after it, $\overline{CuCu}\ \overline{SO_4Cu}\ \overline{SO_4|^dH}\ \overline{SO_4,H}\ \overline{SO_4Zn}$. The discharge, therefore, effects a deposition of copper at the copper, and the formation of sulphionide of hydrogen at the porous cell, and of sulphionide of zinc at the zinc rod. Instead of hydrogen in its nascent state being deposited at the copper, we have copper in the same condition; but the galvanic polarisation caused by the latter is very much inferior to that resulting from the former, and hence the superior electromotive force of Daniell's cell. The porous cell keeps the sulphate of zinc from reaching the copper, and thus obviates another source of diminished force in the one-fluid battery. The sulphate of zinc once formed, is itself subjected to the decomposing action of the pile, and zinc is deposited on the copper-plate, thus tending to give a zinc-zinc instead of a copper-zinc pair. The constancy of Daniell's battery is not unlimited, for the sulphate of zinc which results from the action, being a bad conductor of electricity, enfeebles the current. From its great specific gravity, however, it falls to the bottom of the cell, and may be removed by a siphon, and replaced by fresh liquid. A battery of Daniell's cells is put up in the usual way.

Grove's Battery consists of platinum-zinc couples. Fig. 13 shews an excellent arrangement of a cell of it. The outer cell of glass, *g*, is filled with dilute sulphuric acid (1 part of acid to 8 of water), in which a cylindrical plate of zinc, *z*, is immersed. Inside the zinc is a porous cell, *d*, containing concentrated nitric acid and the platinum plate, *p*, which is bent into the form of an S (fig. 14), to increase its surface. Grove's couple is very much superior in power to any of the preceding, though it is inferior in constancy to Daniell's. When the poles are joined, sulphate of zinc is formed in the outer cell, and hyponitric acid (NO_4) vapours are given off by the nitric acid. As these vapours are injurious to the health when breathed for any time, the porous cell is closed with a stopper of wood, to prevent or lessen their escape, the connection between the exterior and the platinum plate being made by a strip of metal passing through the wood. The chemical action of Grove's couple may be shewn in the same way as Daniell's, taking nitric acid (NO_5) to be the oxide of hyponitric acid (NO_4). Before discharge, the molecules stand thus, beginning with the platinum: $Pt,\overline{NO_4,O}\ \overline{NO_4,O}\ |^d\overline{H,SO_4}\ \overline{H,SO_4},Zn$; and after it, $\overline{Pt,NO_4}\ \overline{O,NO_4}\ \overline{O|^dH}\ \overline{SO_4,H},\ \overline{SO_4,Zn}$. The hyponitric acid gas (NO_4) discharged at the platinum plate is absorbed by the nitric acid, in which it is soluble, so that the plate is left free. The cells of a Grove's battery are connected with the platinum of the one to the zinc of the other.

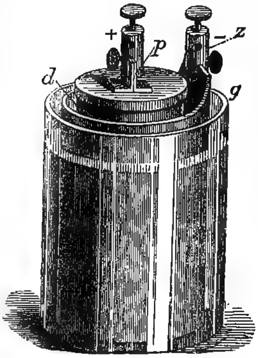


Fig. 13.

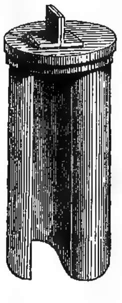


Fig. 14.

Bunsen's Battery.—Bunsen's cell has the same chemical action as Grove's, the platinum being replaced by carbon. There are two forms of the cell—the one invented and employed by Professor Bunsen, and generally adopted in Germany; and the modification introduced by Archerau, generally found in England and France. The Bunsen cell, properly so called, has a carbon cylinder immersed in nitric acid, and the porous cell containing the zinc and sulphuric acid placed within it. Fig. 15 represents a battery of four cells, shewing how the different cells are connected: *g* is the containing glass vessel; *c*, the carbon cylinder; *d*, the porous cell; and *z*, the zinc. The other form of the Bunsen cell is shewn in fig. 16. In it the same arrangement is adopted as in Grove's cell. The latter form of the Bunsen cell, in consequence of the preponderance of the positive surface, gives the greater quantity of electricity. For the manufacture of the Bunsen carbons, see CARBON FOR ELECTRIC PURPOSES. Bunsen's battery, in point of cheapness, is preferable to Grove's, where the platinum forms an expensive item, but is inferior to it in point of compactness. In these couples, the platinum and carbon may be

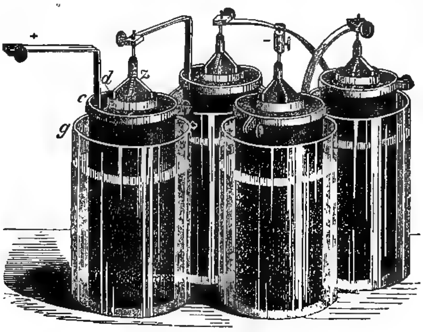


Fig. 15.

replaced by iron, which is nearly as electro-negative as either in concentrated nitric acid. In Müller's *Physik*, the following numbers are given as the relations of the electromotive forces of the different couples: Bunsen's, 800; Grove's, 780; Daniell's 470; and Wollaston's, 208.

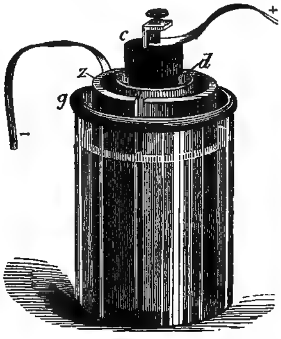


Fig. 16.

Galvanometers.—The two most reliable evidences of the strength of the galvanic current are, its power to deflect the magnetic needle, and to effect chemical decomposition. To measure one or other of these, is the object of a galvanometer or voltameter. A magnetic galvanometer shews the strength of the current by the amount of the deflection of the needle, and shews its direction by the way in which it deflects. The manner in which a needle should turn when influenced by a current is easily kept in mind by Ampere's rule: *Suppose the diminutive figure of a man to be placed in the circuit, so that the current shall enter by his feet, and leave by his head; when he looks with his face to the needle, its north pole always turns to his left.* The deflecting wire is supposed always to lie in the magnetic meridian. The *Astatic Galvanometer*, or *Galvanometer*, is used either simply as a galvanoscope, to discover the existence of a current, or as a measurer of the strengths of weak currents. When a needle is placed under a straight wire, through which a current passes, it deflects to a certain extent, and when the wire is bent, so as also to pass below the needle, it deflects still more. This is easily understood from the above rule. The supposed figure has to look down to the needle when in the upper wire, and to look up to it in the lower wire, so that his left hand is turned in different ways in the two positions. The current in the upper and the lower wire moves in opposite directions, thus changing in the same way as the figure; and the deflection caused by both wires is in the same direction. By thus doubling the wire, we double the deflecting force. If the wire, instead of making only one such circuit round the needle, were to make two, the force would be again doubled, and if several, the force (leaving out of account the weakening of the current caused by the additional wire) would be increased in proportion. If the circuits of the wire be so multiplied as to form a coil, this force would be enormously increased. Two needles, as nearly the same as possible, placed parallel to each other, with their poles in opposite ways, as shewn in fig. 17, and suspended, so as to move freely, by a thread without twist, have little tendency to place themselves in the magnetic meridian, for the one would move in a contrary direction to the other. If they were exactly of the same power, they would remain indifferently in any position. They cannot, however, be so accurately paired as this, so that they always take up a fixed position, arising from the one being somewhat stronger than the other. This position is sometimes in the magnetic meridian, sometimes not, according as the needles are less or more perfectly matched. Such a compound needle is called *astatic*, as it stands apart from the directing magnetic influence of the earth. If an astatic needle be placed in a coil, as in fig. 17, so that the lower needle be within the coil, and the upper one above it, its deflections will be more considerable than a simple needle, for two reasons: in the first place, the power which keeps the needle in its fixed position is small, and the needle is consequently more easily influenced; in the second place, the force of the coil is exerted in the same direction on two needles instead of one, for the upper needle being much nearer the upper part of the coil than the lower, is deflected alone by it, and the deflection is in the same direction as that of the lower needle. An astatic needle so placed in a coil constitutes an astatic galvanometer. One of these instruments is shewn in fig. 18. Round an ivory bobbin, AB, a coil of fine copper wire, carefully insulated with silk, is wound, its ends being connected with the binding screws, *s*, *s'*. The astatic needle is placed in the bobbin, which is provided with a vertical slit, to admit the lower needle, and a lateral slit, to allow of its oscillations, and is suspended by a cocoon thread to a hook supported by a brass frame. The upper needle moves on a graduated circle; the compound needle hangs freely, without touching the bobbin. The whole is included in a glass case, and rests on a stand, supported by three levelling screws. When used, the bobbin is turned round by the screw, Q, until the needle stands at the zero point, and the wires through which the current is sent are fixed to the binding screws. The number of degrees that the needle deflects may then be read off. It is manifest that on deflection taking place, the different portions of the coil are differently situated with respect to the

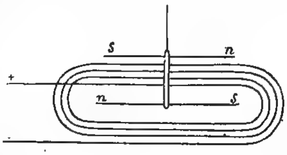


Fig. 17.

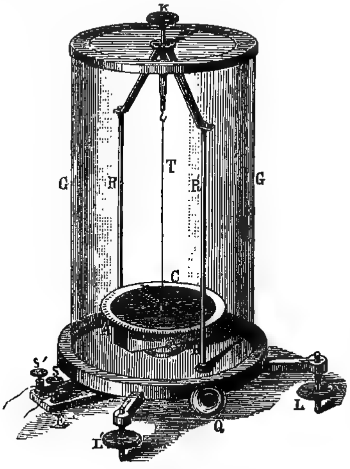


Fig. 18.

needle, than when it is at zero; the deflecting force of the coil, therefore, differs with the position of the needle, so that the deflections caused by different currents are not in the proportion of the angles of deviation, or their functions; up to from 15° to 20°, it is found for most instruments that the strength of the current is proportional to the angle of deviation; beyond that, the relations of strength indicated by different angles must be ascertained experimentally, which can be done with the aid of a thermo-electric pile.

Tangent Galvanometer.—This instrument is shewn in fig. 19. It consists essentially of a thick strip of copper, bent into the form of a circle, from one to two feet in diameter, with a small magnetic needle, moving on a graduated circle, at its centre. When the needle is small compared with the ring, it may be assumed that the needle in any direction it lies holds the same relative position to the disturbing power of the ring. This being the case, it is easy to prove that *the strengths of currents circulating in the ring are proportionate to the tangents of the angles of deviation of the needle.* Thus, if the deflection caused by one galvanic couple was 45°, and of another 60°, the relative strengths of the currents sent by each would be as the tangent of 45° to the tangent of 60°—viz., as 1 to 1·73. The needle can never be deflected 90°, for as the tangent of 90° is infinitely large, the strength of the deviating current must be infinitely great, a strength manifestly unattainable. The tangent galvanometer can consequently be used to measure the strongest currents. One great advantage attending its use, is that the current, in passing through the thick copper wire, experiences almost no resistance, and consequent diminution of strength, so that it can measure a current without affecting it.

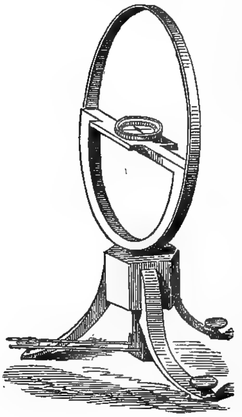


Fig. 19.

Voltameter.—This was invented by Faraday for testing the strength of a current. Fig. 20 shews how it may be constructed. Two platinum plates, each about half a square inch in size, are placed in a bottle containing water acidulated with sulphuric acid; the plates are soldered to wires which pass up through the cork of the bottle; binding screws are attached to the upper ends of these wires; a glass tube fixed into the cork serves to discharge the gas formed within. When the binding screws are connected with the poles of a battery, the water in the bottle begins to be decomposed, and hydrogen and oxygen rise to the surface. If, now, the outer end of the discharging tube be placed in a trough of mercury (mercury does not dissolve the gases), and a graduated tube (fig. 21), likewise filled with mercury, be placed over it, the combined gases rise into the tube, and *the quantity of gas given off in a given time measures the strength of the current.* The voltameter chooses as a test the work which the current can actually perform, and establishes a uniform standard of comparison. The indications of the tangent galvanometer are comparable only with its own, but the quantity of gas discharged by the voltameter, corrected for pressure and temperature, is something quite absolute. However, by comparing the indications of both instruments with each other when placed in the same circuit, an absolute standard may likewise be got for the tangent galvanometer. If, for instance, the current given by a battery should give 2 cubic inches in a minute, as shewn by the voltameter, and produced at the same time a deflection of 45° in the galvanometer, the ratio of 2 to the tangent of 45°—viz., 2 to 1 = 2, is constant, for correct measurements of the strength of currents, however taken, must bear to each other a constant ratio. If the angle of deviation for another current was 30°, we have therefore only to multiply 2 by the tangent of 30°, to ascertain the amount of gas that would be liberated by a current of that strength in a minute. This found, we know the meaning of a deflection of 30° of the galvanometer in question in a perfectly comparable standard. The plates of the voltameter must be small, for when they are large, a small quantity of electricity is found to pass without decomposing the water. It is found also that a minute quantity of the oxygen forms binoxide of hydrogen with the water, and remains in solution, so that when very great accuracy is required, the hydrogen alone ought to be measured.

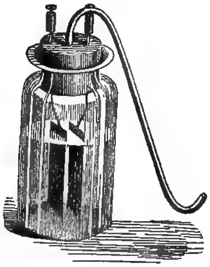


Fig. 20.

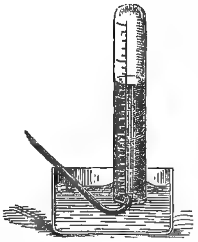


Fig. 21.

Resistances to the Current.—It is found that the dimensions and material of substances included in the circuit exercise an important influence on the strength of the current. It is of the greatest importance to ascertain the relative amount of the resistance offered by conductors of various forms and materials. The *rheostat,* invented by Wheatstone, is generally employed for this purpose, and for this object is constructed so as to introduce or withdraw a considerable amount of highly resisting wire from the circuit without stopping the current. It is shewn in fig. 22. Two cylinders, C′, C, about 6 inches in length, and $1\frac{1}{2}$ inch in diameter, are placed parallel to each other, both being movable round their axis. One of them, C′, is of brass, the other, C, is of well-dried wood. The wooden cylinder has a spiral groove cut into it, making forty turns to the inch, in which is placed a fine metallic wire. One end of the wire is fixed to a brass ring, which is seen in the figure at the further end of the wooden cylinder; and its other end is attached to the nearer end (not seen in the figure) of the brass cylinder, C′. The brass ring just mentioned is connected with the binding screw, S, by a strong metal spring. The further end of the cylinder C′, has a similar

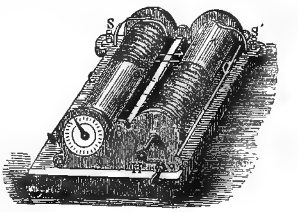


Fig. 22.

connection with the binding screw, S′. The key, H, fits the projecting staple of either cylinder, and can consequently turn both. As the brass cylinder, C′, is turned in the same direction as the hands of a watch, it uncoils the wire from the wooden cylinder, C, making it thereby revolve in the same way. When the wooden cylinder is turned contrary to the hands of a watch, the reverse takes place. The number of revolutions is shewn by a scale placed between the two, and the fraction of a revolution is shewn by a pointer moving on the graduated circle, P. When the binding screws, S and S′, are included within a circuit, say S with the positive, and S′ with the negative pole, the current passes along the wire, on the wooden cylinder, C, till it comes to the point where the wire crosses to the brass cylinder, C′; it then passes up the cylinder, C′, to the spring and binding screw, S′. The resistance it encounters within the rheostat is met only in wire, for as soon as it reaches the large cylinder, C′, the resistance it encounters up to S′ may be considered as nothing. When the rheostat is to be used, the whole of the wire is wound on the wooden cylinder, C, the binding screws are put into the circuit of a constant cell or battery along with a galvanometer, astatic or tangent. If, now, the resistances of two wires are to be tested, the galvanometer is read before the first is put in the circuit. After it is introduced, in consequence of the increased resistance offered by it, the needle falls back, and then as much of the rheostat wire is unwound as will bring the needle back to its former place. The quantity of wire thus uncoiled in the rheostat is shewn by the scales, and is manifestly equal in resisting power to the introduced wire. The first is then removed, the rheostat readjusted, and the second wire included, and the same unwinding goes on as before. To fix our ideas, let the quantity of wire unwound in the first case be 40 inches, and in the second case 60 inches; 40 inches of the rheostat wire offer as much resistance to the current as the first wire, and 60 inches of it as much as the second. We have thus 40 to 60 as the ratio of the resistances of the two wires. The wire of the rheostat, from its limited length, can only be comparable with small resistances; and where great resistances are to be measured, supplementary *resistance coils* of wires, whose resistances have been ascertained, are introduced into the circuit, or removed from it, as occasion requires, leaving to the rheostat to give, as it were, only the fractional readings. This being premised, it will be easily understood how the following results have been ascertained. It is proved, for instance, that the *resistances of wires of the same material, and of uniform thickness, are in the direct ratio of their lengths; and in the inverse ratio of the squares of their diameters.* Thus a wire of a certain length offers twice the resistance of its half, thrice of its third, and so forth. Again, wires of the same metal, whose diameters stand in the ratio of 1, 2, 3, &c., offer resistances which stand to each other as 1, $\frac{1}{4}$, $\frac{1}{9}$, &c.; therefore, the longer the wire the greater the resistance; the thicker the wire the less the resistance. The same holds true of liquids, but not with the same exactness. For this reason, the larger the plates of a galvanic pair, and the nearer they are placed to each other, the less will be the resistance offered to the current by the intervening liquid. The following table, constructed by Ed. Becquerel, gives the *specific resistances* of some of the more common substances, or the resistance which a wire of them, so to speak, of the same dimensions, offers at the temperature 54° F.: Copper, 1; silver, ·9; gold, 1·4; zinc, 3·7; tin, 6·6; iron, 7·5; lead, 11; platinum, 11·3; mercury (at 57°), 50·7. For liquids, the resistances are enormous as compared with the metals. With copper at 32° F. as 1, the following liquids stand thus: Saturated solution of the sulphate of copper, at 48° F., 16,885,520; ditto of chloride of sodium at 56° F., 2,903,538; sulphate of zinc, 15,861,267; sulphuric acid, diluted to $\frac{1}{11}$, at 68° F., 1,032,020; nitric acid, at 55° F., 976,000; distilled water, at 59° F., 6,754,208,000. The slightest admixture of a foreign metal alters the resistance very decidedly: $\frac{1}{6}$ per cent of iron in copper wire increases the resistance more than 25 per cent. It has been found also that the resistance offered by a wire increases as its temperature rises. It is almost needless to add, that the conducting powers of metals are inversely as their specific resistances, the least resisting being the best conducting.

Ohm's Law.—This law is singularly in accordance with experimental results. It assumes that the electro-motive force for a particular galvanic pair is constant, and that the strength of the current it produces is the quotient which results from dividing it by the resistance of the circuit. This resistance arises from two sources, the first being the resistance within the cell offered by the exciting liquid, and the second the interpolar resistance. If e represent the electromotive force; l, the resistance within the cell; w, the interpolar resistance; and S, the strength of the current, or the quantity of electricity actually transmitted, the statement of the law for one couple stands thus: $S = \frac{e}{l + w}$. The application of the law in a few particular cases will best illustrate its meaning. If we increase the number of cells to n, we increase the electromotive force n times, and at the same time we increase the liquid resistance n times, for the current has n times as much of it to travel, then $S = \frac{ne}{nl + w}$. If w be small compared with nl—that is, if the external connection be made by a short thick wire—it may be neglected, and so $S = \frac{ne}{nl} = \frac{e}{l}$. This shews that one cell gives in these circumstances as powerful a current as a large battery. But if nl be small with respect to w—as in the interpolar circuit of an electric telegraph battery—nl may be neglected, and $S = \frac{ne}{w}$. Here we learn that the energy of the current increases directly as the number of cells. We may learn from the same that the introduction of the coil of long thin wire of a galvanometer into such a circuit, introducing but a comparatively small increase of resistance, causes a very slight diminution of the current strength. If, again, we increase the size of the plates of a galvanic pair n times, the section of the liquid is proportionately increased, so that whilst the electromotive force remains the same, the cell resistance diminishes n times; therefore $S = \frac{e}{\frac{l}{n} + w}$, or $S = \frac{ne}{l + nw}$. If the exterior resistance is small, nl may be neglected, and $S = \frac{ne}{l}$, and the strength is thus shewn to increase n times. These are only a very few of the conclusions arrived at by this law. With the aid of a tangent galvanometer, which gives the value of S expressed in cubic inches of voltameter gas, we can easily ascertain the value of e and l for any pair. By making two observations with two wires of known resistance separately included in the circuit, we have two simple equations with two unknown quantities, from which *e* and *l* can be easily found. In doing so, we must adopt a *unit of resistance*, such as that proposed by Jacobi—viz., that offered by a copper wire 1 mètre (39·3 inches) long, and 1 millimètre (·0393 inch) in diameter. The resistance of the liquid of the pair would be expressed in units of this, and the electromotive force in cubic inches of explosive gas with a circuit offering a unit of resistance.

The Effects of the Galvanic Current may be classified under physiological, mechanical, magnetic, heating, luminous, and chemical. The mechanical effects relate to the mutual attraction or repulsion of one current to another, or to a part of itself. These, along with the magnetic effects, will be found treated of under Magneto Electricity. The heating and luminous effects have been partly discussed under Electric Light. We shall here only further refer to the heating of wires, and to the galvanic spark. The luminous effects of galvanic electricity of very high tension will be given under Induction Coil. The chemical effects have been already referred to, but a fuller consideration of these will now be given under the head Electrolysis in this article.

The physiological effects, as shewn by the convulsions of Galvani's frog preparation, were the first observed manifestation of the current. Frog-limbs, as prepared by Galvani, when included in a circuit, form a galvanoscope of excessive sensibility, which rivals the finest galvanometer in delicacy of indication. There is one peculiarity in their action which deserves to be noted. The limbs contract only when the circuit is completed and broken, and remain undisturbed so long as the current passes steadily through them. The more frequently, therefore, the current is stopped and renewed, the greater is the physiological effect. The same is experienced when a current is passed through the human body. When the terminal wires of a battery are lifted one by each hand, except it consist of a very large number of cells, almost the only sensation felt is a slight shock on completing and breaking the circuit. Du Bois Reymond, the great authority on animal electricity, states that the nerves of motion are affected only by changes in the electric tension of the current, whereas the nerves of sensation are affected not only by these, but also by the steady continuance of the current, and that the excitation of the nerves dependent on the changes of tension increases with their frequency and suddenness. Frictional electricity in this way owes its superior physiological power to the instantaneous nature of its discharge. It is only currents of great tension which affect the ordinary human nerves. The poles of a battery of 50 Bunsen cells, capable of giving a brilliant electric light, for instance, may be handled without much inconvenience. This may be attributed partly to the non-conducting nature of the skin. If the current enter the body by a cut or wound, the sensation is affected even when the current is weak. The physiological effect is also much heightened by moistening the hands with salt and water, or by holding metal handles instead of wires, so as to improve the conducting connection. Another cause of this insensibility may be attributed to the fact that the current is not restricted, as it is in part of the frog preparation, to the nerve, but passes through all the conductors of the system. The nerves of the palate can be affected by a very feeble current; that of sight by one proceeding from a battery of one or two cells, and that of hearing by a battery of some 30 cells. See Electricity, Medical.

Heating Effects.—When a strong current passes through thin wires, an intense heat is produced, sufficient to bring them to a white heat, and to fuse them. This is turned to practical use in exploding gunpowder, in engineering and mining operations. Two wires of a battery placed at a safe distance are insulated from each other, and their ends, which are connected by a fine iron wire, are sealed up in a tin cartridge filled with gunpowder, and laid in the exploding charge. When all is adjusted, the battery connection is completed, and the current making the iron wire red hot, ignites the gunpowder in the cartridge, and that again the charge. In this way, all danger is avoided. Experiments on the heating effects of the current through wires have proved that *the heat developed is proportional to the resistance of the wires, and to the squares of the strength of the currents; and that the strength of the current being the same, any length of wire may be heated to the same redness.*

Galvanic Spark.—When the wires connected with a powerful galvanic battery are brought together, no current passes except they are made to touch, or nearly so; and if then separated, the current continues with the evolution of sparks, though removed for some distance. Jacobi found that the poles of a battery of twelve Grove's cells could be brought as near as ·00005 of an inch without a spark passing. In Gassiot's water battery of 3520 well-insulated cells, however, a spark passed when the poles were brought to ·02 of an inch, and continued to do so uninterruptedly for weeks and months together. When the galvanic spark is examined with a microscope, it is found that the light only appears at the negative pole.

Electrolysis is that branch of the science of galvanism which treats of the laws and conditions of electro-chemical decomposition. As this decomposition is generally attended by electro-chemical combination, it is sometimes difficult to distinguish electrolysis from the more general subject of *Electro-chemistry*, which embraces all chemical changes resulting in or from the galvanic current. In one case, however, the application of the term is strictly correct—viz., where decompositions are effected by electrodes (poles, see Anode), which are not attacked by the elements of the electrolyte (the substance decomposed) discharged at them. Throughout the article, there have been frequent allusions to electro-chemical changes, but here we shall discuss more particularly the laws of electro-chemical decomposition. No substance is decomposed by the current so long as it is in a solid or gaseous state, and it must first be brought to a liquid state, either by solution or fusion, before the current acts on it. The decomposition of water by platinum plates is always taken as the type of electrolytic action. Fig. 23 represents a very convenient apparatus for the purpose. A glass basin is made so as to admit a cork below, through which two wires pass having slips of platinum plate soldered to them above. Two glass tubes, open below, are hung over the plates, to hooks projecting from an upright support. The bowl is

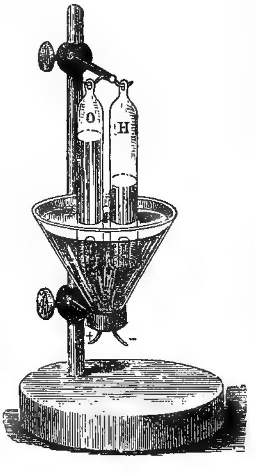


Fig. 23.

filled with acidulated water; and the tubes, after being filled with the same, are inverted, and hung with their lower ends enclosing the plates. When the wires projecting downwards from the cork are connected with the poles of the battery, hydrogen rises from the negative, and oxygen from the positive electrode, to fill each its separate tube. As the decomposition proceeds, twice as much hydrogen is liberated as oxygen. When the tubes are filled, they may be removed and examined. The oxygen thus obtained smells strongly of ozone. Hydrogen is here the type of the metals or other electro-positive substances (cations), which, during electrolysis, are always disengaged at the negative electrode; and oxygen of the salt radicals, chlorine, iodine, sulphur, &c., which, being electro-negative (anions), always appear at the positive pole. Moreover, the proportions of the volumes of the two gases being that of their chemical combining volumes, reminds us that, when a body is decomposed, its components are always separated in the proportions in which they were united, viz., those of their chemical equivalents. If the tubes of this apparatus were graduated, it would serve for a voltameter. If, instead of one such voltameter included in the circuit, we had several, we should find that, whatever amount of gas was liberated in one of these, the same amount would be liberated in all, and that independent of the size of the plates, and amount of acid in each. We learn, therefore, that the chemical power of the current is the same at every point of the circuit where it is manifested. If, instead of two or three voltameters in the circuit, we had one and two decomposing cells of the following description. A test tube, having a platinum wire, on which the glass has been fused, passing through the bottom, is partially filled with protochloride of tin, which is kept fused by the heat of a spirit-lamp. The platinum wire at the bottom of the tube forms one electrode, and one descending from the top forms the other, dipping below the fused chloride. If, then, this cell be included in the circuit along with the voltameter, and a similar cell containing fused chloride of lead, so that the current enters the tubes by the upper electrodes, and leaves by the lower, the water, protochloride of tin, and chloride of lead, are decomposed simultaneously by the current passing through each. In the voltameter, hydrogen and oxygen are disengaged; in the tubes, metallic tin is deposited at the lower electrode of the one, and lead at the other; whilst chlorine is liberated at the upper electrodes of both. If, now, the quantity of hydrogen, tin, and lead thus set free be weighed, it will be found that their weights are in the proportion of their chemical equivalents. From such experiments as these, Faraday made the first grand electrolytic generalisation to the following effect: *When the current passes through a series of binary electrolytes, consisting of an equivalent of each of the elementary bodies, the quantities of the separated elements of the electrolytes are in the same proportion as their chemical equivalents.* It is not only in cells exterior to the battery that this law holds, but in the cells of the battery itself. If the battery which effected the above decomposition consisted of six cells, for each equivalent of hydrogen, tin, and lead separated without the battery, one equivalent of zinc in each cell would have been dissolved, and an equivalent of hydrogen disengaged at each of the copper plates, if the cells were one-fluid. The above law holds also for binary compounds, whose elements do not stand in the relation of an equivalent of the one to an equivalent of the other, but with this modification, that the weights of the electro-negative elements alone, separated in the action, are in the ratio of their equivalents. Thus, if the same current pass through two decomposing cells, one containing a solution of the subchloride of copper (Cu_2Cl), and the other of the chloride of copper ($CuCl$), the same quantity of chlorine will be disengaged in both, but twice as much copper is deposited in the first as in the second. Had there been a sesquichloride of copper (Cu_2Cl_3) in the same way for one equivalent of chlorine disengaged, there would be $\frac{2}{3}$ of an equivalent of copper. Daniell proved, in extension of Faraday's law, that the binary constituents of the oxisalts followed the same law as binary elementary compounds; he shewed that, if a voltameter, and a vessel divided into two compartments by a porous diaphragm, both containing sulphate of soda (NaO,SO_3), be included in the same circuit, after some time, the compartment into which the positive pole dips contains free sulphuric acid (SO_3), and that the other compartment contains free soda (NaO); and the hydrogen and oxygen of the voltameter, and the soda and sulphuric acid of the sulphate of soda, when weighed, stand in the ratio of their chemical equivalents. The decomposition here taking place was found to be the same in all similar salts. One effect of the decomposition in the above instance, however, seemed singular—nearly as much oxygen and hydrogen was decomposed at the electrodes as in the voltameter, so that the current appeared to do double work within the cell. To account for this anomaly, Daniell suggested a new theory of oxisalts, to which we have already referred in passing. According to it, sulphate of soda (NaO,SO_3) should not be looked upon as such, but as sulphionide of sodium ($NaSO_4$), a binary salt similar to the chloride of sodium ($NaCl$); with this difference, that, in the former case, the salt radical sulphion (SO_4) was compound, and in the latter it was simple (Cl). This being the case, the primary stage of decomposition will be, the metal sodium (Na) set free at the negative, and the sulphion (SO_4) at the positive electrode; but sodium being highly oxidable, cannot preserve its metallic condition in the presence of water; it therefore decomposes the water, taking its oxygen, and setting free its hydrogen, so that the hydrogen does not come directly from electrolytic action, but from a purely chemical *secondary action*—viz., that of sodium on water. The sulphion (SO_4) breaks up into sulphuric acid (SO_3), which remains in solution, and oxygen (O), which escapes. This view of the matter appeared to him to be borne out by the fact that, when a similar salt of a less oxidable metal, the sulphate of copper, for instance, is exposed to the same action, the copper retains its metallic condition, and no hydrogen escapes at the negative electrode; sulphate of copper ($CuOSO_3$) is in this way more properly sulphionide of copper ($CuSO_4$). Similarly, nitrate of soda ($NaONO_5$) is $NaNO_6$, nitrionide of copper, and the like composition is given to all oxisalts. This view of the composition of salts reduces all electrolytes to the same general formulæ, such as MR, M_2R_3, &c.; M being a metal, or electro-positive constituent, and R a salt radical, or electro-negative; and the electrolytic law might be given thus: *When the same current passes through a series of electrolytes, the weights of the separated electro-negative constituents are to each other as their chemical equivalents.* The accuracy of the electrolytic law is somewhat compromised by the fact that liquids possess, to a certain extent, the power of conducting, physically, electricity without electrolytic action, so that all that passes in this way is chemically lost. Fortunately, the error thus introduced is very small, and can be therefore practically disregarded.

ELECTRO-METALLURGY is the art of depositing, electro-chemically, a coating of metal on a surface prepared to receive it. It may be divided into two great divisions—electrotype and electro-plating, gilding, &c., the former including all cases where the coating of metal has to be removed from the surface on which it is deposited, and the latter all cases where the coating remains permanently fixed. Gold, platinum, silver, copper, zinc, tin, lead, cobalt, nickel, can be deposited electrolytically.

Electrotype—the art of copying seals, medals, engraved plates, ornaments, &c., by means of the galvanic current in metal, more especially copper. The manner in which this is done will be best understood by taking a particular instance. Suppose we wish to copy a seal in copper: an impression of it is first taken in gutta percha, sealing-wax, fusible metal, or other substance which takes, when heated, a sharp impression. While the impression—say, in gutta percha—is still soft, we insert a wire into the side of it. As gutta percha is not a conductor of electricity, it is necessary to make the side on which the impression is taken conducting; this is done by brushing it over with plumbago by a camel-hair brush. The wire is next attached to the zinc pole of a weakly charged Daniell's cell, and a copper plate is attached by a wire to the copper pole of the cell. When the impression and the copper plate are dipped into a strong solution of the sulphate of copper, they act as the negative and positive electrodes. The copper of the solution begins to deposit itself on the impression, first at the black-leaded surface in the vicinity of the connecting wire, then it gradually creeps over the whole conducting surface. After a day or two, the impression is taken out; and the copper deposited on it, which has now formed a tolerably strong plate, can be easily removed by inserting the point of a knife between the impression and the edge of the plate. On the side of this plate, next the copper, we have a perfect copy of the original seal. If a medal or coin is to be taken, we may proceed in the same way, or we may take the medal itself, and lay the copper on it. In the latter case, the first cast, so to speak, that we take of each face is negative, shewing depressions where the medal shews relief; but this is taken as the matrix for a second copy, which exactly resembles the original. The adhesion between the two is slight, and they can be easily separated. The cell of a battery is not needed to excite the current. A galvanic pair can be made out of the object to be coated and a piece of zinc. Fig. 24 shews how this may be done. B is a glass vessel, containing sulphate of copper; A is another, supported on B by a wire-frame, and containing a weak solution of sulphuric acid. The glass vessel, A, is without a bottom, but is closed below by a bladder. A piece of zinc, Z, is put in the sulphuric acid, and a wire, D, coated with insulating varnish, establishes a connection between it and the impression, C, which is laid below the bladder. Electrotype is of the greatest importance in the arts; by means of it, engraved copper plates may be multiplied indefinitely, so that proof-impressions need be no rarity; wood-cuts can be converted into copper; bronzes can be copied; and several like applications are made of it too numerous to mention. By connecting a copper plate ready for corrosion with the positive pole, and making it a positive electrode, it can be etched with more certainty than with the simple acid, and without the acid fumes.

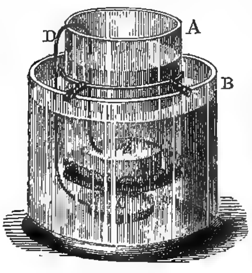


Fig. 24.

Electro-plating.—This is the art of coating the baser metals with silver by the galvanic current. It is one theoretically of great simplicity, but requires in the successful application of it very considerable experience and skill. Articles that are electro-plated are generally made of brass, bronze, copper, or nickel silver. The best electro-plated goods are of nickel silver. When Britannia metal, iron, zinc, or lead are electro-plated, they must be first electro-coppered, as silver does not adhere to the bare surfaces of these metals. Great care is taken in cleaning the articles previous to electro-plating, for any surface impurity would spoil the success of the operation. They are first boiled in caustic potash, to remove any adhering grease; they are then immersed in dilute nitric acid, to dissolve any rust or oxide that may be formed on the surface; and they are lastly scoured with fine sand. Before being put into the silvering bath, they are washed with nitrate of mercury, which leaves a thin film of mercury on them, which acts as a cement between the article and the silver. The bath where the electro-plating takes place is a large trough of earthenware or other non-conducting substance. It contains a weak solution of cyanide of silver in cyanide of potassium. A plate of silver forms the positive electrode; and the articles to be plated, hung by pieces of wire to a metal rod lying across the trough, constitute the negative electrode. When the plate is connected with the copper or positive pole of a one or more celled galvanic battery, according to the strength required, and the rod is joined with the zinc or negative pole, chemical decomposition immediately ensues in the bath, the silver of the cyanide begins to deposit itself on the suspended objects, and the cyanogen, liberated at the plate, dissolves it, re-forming the cyanide of silver. According, then, as the solution is weakened by the loss of the metal going to form the electro-coating, it is strengthened by the cyanide of silver formed at the plate. The thickness of the plate depends on the time of its immersion. The electric current thus acts as the carrier of the metal of the plate to the objects immersed. In this way, silver becomes perfectly plastic in our hands. We can by this means, without mechanical exertion or the craft of the workman, convert a piece of silver of any shape, however irregular, into a uniform plate, which covers, but in no way defaces, objects of the most complicated and delicate forms. When the plated objects are taken from the bath, they appear dull and white; the dulness is first removed by a small circular brush of brass wire driven by a lathe, and the final polish is given by burnishing. The process of electro-gilding is almost identical with that of electro-plating. Success in either is attained by proper attention to the strength of the battery, the strength of the solution, the temperature, and the size of the positive electrode.

GA'LVESTON, a city and seaport of the state of Texas, North America, is situated on the north-east extremity of Galveston Island, at the opening of the bay of the same name into the Gulf of Mexico; lat. 29° 18′ N., long. 94° 50′ W. It is the largest and most commercial city of Texas. Its harbour, the best in the state, has 12 feet of water over the bar at low tide. Its streets are straight, spacious, and elegant; and its principal buildings—the Roman Catholic University of St Mary's, the Roman Catholic Cathedral, and the Episcopal Church—are large, imposing edifices of brick in the Gothic style. G. has also numerous churches, a convent of Ursuline nuns, and a number of schools of various kinds. Here nearly all the foreign trade of the state is transacted. In 1858, 61 foreign vessels, of 26,373 tons, entered and cleared the port; but the greater proportion of the trade is along the coast. In 1856, the number of entrances of coasting-vessels was 3594, 1065 being steamers, regular lines of which ply from this town to New York and New Orleans, as well as to the south-west towns of Texas. The principal trade is in shipping cotton, of which from 300,000 to 400,000 bales were exported in 1859. The town has good wharfs, several ship-building yards, foundries, machine-shops, cotton-presses, &c. Population estimated in 1850 at 4177; in 1859, at 10,000. The Bay of Galveston extends northward from the city to the mouth of Trinity River, a distance of about 35 miles, and is from 12 to 18 miles broad. The island of Galveston is a long strip of low-lying ground with a mean elevation of from 3 to 4 feet above sea-level, and is about 28 miles long, and from 1½ to 3½ miles broad. It was, from 1817 to 1821, the haunt of the notorious pirate Lafitte, who was dislodged in the latter year, and his settlement broken up.

GA'LWAY, a municipal and parliamentary borough of Ireland, a seaport, and county of itself, stands at the mouth of the river Corrib, on the north shore of Galway Bay, 50 miles north-north-west from Limerick, and 130 miles west-south-west from Dublin. It is built on both sides of the river, and on two islands in its channel, its parts being united by two bridges. It is connected with Lough Corrib by a canal, and forms the terminus of the Midland Great Western Railway. A line of steamers has, with a few interruptions, run for the last four years between G. and the North American colonies, seven days being considered the usual time for a fair passage. The old town of G. is poorly built and irregular, and some of its older houses have a somewhat Spanish appearance, which is accounted for by the commercial intercourse which at one time subsisted between G. and Spain. To one of these houses, which is marked with a skull and cross-bones, a very remarkable story is attached, of a mayor of G., James Lynch Fitzstephen, who, in 1493, like Brutus of old, condemned his own son to death for murder, and in order to prevent his being rescued, actually caused him to be hanged from his own window. The new town consists of well-planned and spacious streets, and is built on a rising-ground, which slopes gradually toward the sea and the river. The suburbs are mainly collections of wretched cabins, inhabited by a miserably poor class of people. One of these suburbs, called Claddagh, is inhabited by fishermen, who exclude all strangers from their society, and marry within their own circle. These fishermen still speak the Irish language, and the Irish costume is still worn by the women. They annually elect a 'mayor,' whose function it is to administer the laws of their fishery, and to superintend all internal regulations. One of the principal buildings of G. is the parish church of St Nicholas, founded in 1320, in connection with which is an ecclesiastical body called the Royal College of Galway, consisting of a warden and eight vicars choral, who are elected by the Protestant members of the corporation. In the Roman Catholic Church a similar ecclesiastical arrangement formerly existed. The see of Enachdune, of which G. formed a part, was united to that of Tuam in 1324; but in 1484, G. was constituted a wardenship, with a distinct jurisdiction, similar to that of an episcopal see. The wardenship, in later times, was held by one of the bishops of the neighbouring sees. The right of electing the warden, however, was vested in certain Catholic clans or families of the town—Blakes, Bodkins, Lynches, Frenches, &c.—who, by a curious local custom were distributed into 13 tribes. This singular system, almost without example in the Catholic Church, continued in use until about 30 years ago; when, in 1831, the wardenship of G. was erected into an episcopal see, the bishop of which is appointed by the same rules which regulate other Episcopal appointments in Ireland. Among the other edifices are three monasteries and five nunneries; the Queen's College, opened in 1849; Erasmus Smith's College, with an endowed income of £126 a year; the county court-house; barracks, &c. G. has numerous flour and other mills, also breweries, distilleries, foundries, &c., extensive salmon and sea fishing, a good harbour, with docks that admit vessels of 500 tons, and a light-house. The exports consist mainly of corn, flour, bacon, fish, kelp, and marble. In 1861, 369 vessels, of 98,255 tons, entered and cleared the port. G. returns two members to parliament. Pop. (1861) of town, 16,786; of parliamentary borough, 24,990; which shews a decrease, since 1851, of 7001 in the former, and of 9156 in the latter.

G. was taken by Richard de Burgo in 1232, and the ancestors of many of the leading families now resident in this quarter settled here about that time. From the 13th till the middle of the 17th c., G. continued to rise in commercial importance. During the latter part of the 17th c., it suffered considerably for its adherence to the royalist cause. In 1652, it was taken by Sir Charles Coote after a blockade of several months; and in July 1691, it was compelled to surrender to General Ginkell.

GALWAY, a maritime county of Ireland, forms the southern portion of the province of Connaught, and is second in size of all the Irish counties, Cork being the largest. It is bounded on the E. by two navigable rivers, the Shannon, and its affluent the Suck; and on the W. by the Atlantic Ocean. It has an area of 1,566,354 acres, of which the one half is arable, and almost the whole of the remainder uncultivated. Pop. (1851) 297,897, (1861) 254,256. The county of G. is watered in the east by the Shannon, the Suck, and their feeders; and in the west by Loughs Mask and Corrib, and by the streams—none of them of any great importance—which fall into the loughs and into Galway Bay. In the most southern portion of the county are the Slieve-Baughta Mountains; and in the west are the well-known Twelve Pins, a striking mountain group, with a general height of about 2000 feet; and the Maam-Turk mountains, of about an equal height. This western portion of the county is exceedingly wild and romantic; the hills are separated by picturesque glens, and by secluded and beautiful loughs. South-west from Lough Corrib to the sea is the district called Connemara, which contains vast bogs, moors, lakes, and morasses, and presents a peculiarly bleak and dreary aspect. North-east of Connemara is Joyce's Country, and south-east of it is Iar-Connaught, or Western Connaught. The coast-line is stated to be about 400 miles in length, and the shore is much broken, and is fringed with numerous islands. On the coasts of Connemara (*Cun-na-mar*, 'bays of the sea') and Iar-Connaught, there are more harbours for vessels of large size than on any equal extent of coast perhaps in Europe. The climate is mild and humid, and in low-lying localities, is sometimes unhealthy. The richest soil occurs in the district between the head of Galway Bay and the Shannon. Agriculture and fishing are the most general pursuits; kelp is largely manufactured; also woollens, linens, friezes, felt hats, are manufactured. The lakes and loughs, as well as the coasts of G., are well stocked with fish. The county of G. abounds in ancient remains of the Celtic as well as of the English period. *Raths* and *cromlechs* are numerous; monastic ruins are found in all parts of the county; a very fine specimen of this class is that of Knockmoy, near Tuam; and there are no fewer than seven round towers in the county. G. county sends two members to parliament.

GALWAY BAY, an inlet of the Atlantic Ocean, on the west coast of Ireland, between the counties of Galway and Clare. It is a noble sheet of water, and offers great facilities for an extended commerce. Great efforts have been made to obtain a public grant for the construction of a harbour of refuge; and a company was formed in 1858 for the establishment of the Transatlantic packet-service alluded to in the article Galway. A series of misadventures, however, has hitherto attended its efforts; but it is hoped that its operations will be resumed with greater vigour in the present year (1862). G. B. is 30 miles in length from west to east, and has an average breadth of about 10 miles. At its entrance, and between the North and South Sounds, are the islands of Arran.

GA'LYZIN, or **GOLYZIN**, also frequently Galizin, Galitzin, or Gallitzin, one of the most numerous, powerful, and distinguished Russian families. It derives its origin from the Lithuanian prince Gedimin, the founder of the Jagellonian dynasty of rulers in Poland, Hungary, and Bohemia. Among the leading members of the family may be mentioned—1. The princes Michail and Dimitri G., Russian commanders under Wassili IV., grand-duke of Warsaw, who were taken prisoners by the Poles at the battle of Orscha in 1514. Dimitri died in captivity, and Michail was only released after a confinement of 38 years.—2. Wassili G., surnamed the Great, born in 1633, was the councillor and favourite of Sophia, the sister of Peter the Great, and regent during his minority. Wassili was a man of liberal culture and civilised tastes. His great aim was to bring Russia into contact with the west of Europe, and to encourage the arts and sciences in the native gymnasia, and at the court itself. His design to marry Sophia, and plant himself on the Russian throne, however, miscarried. Sophia was placed by her brother in a convent, and Wassili was banished to a spot on the Frozen Ocean, where he died of poison.—3. Boris G., cousin of the previous, was Peter the Great's tutor, and one of the administrators of the kingdom during the czar's first journey abroad.—4. Dimitri G., also a cousin of Wassili's, was a distinguished Russian statesman; ambassador at the Turkish court; afterwards director of the imperial finances; and finally head of the reform party of Galyzin and Dolgoruki, which wished to limit the absolute authority of the czar. Dimitri's plan failed; the two families were banished, and Dimitri himself ended his days in the dungeons of Schüsselburg.—5. Michael G., born about 1675, was brother of Dimitri, and one of the most distinguished Russian generals. He was the inseparable companion of Peter the Great in all his campaigns. His most famous achievement was the conquest of Finland. He died at Moscow, 1730.—6. Dimitri G., born 1738, went as Russian ambassador to France in 1763, and to Holland in 1773. He died in 1803. He wrote one or two books, but he owes the preservation of his name mainly to his wife, the celebrated Amalie, Princess G., daughter of the Prussian general, Count von Schmettau. This lady (born at Berlin, August 28, 1748) was remarkable for her literary culture, her grace and amiability of disposition, her sympathetic relations with scholars and poets, but, above all, by her ardent pietism, which found its most congenial sphere in the mystic and venerable sanctities of Roman Catholicism. Having separated from her husband, she took up her residence in Münster, where she gathered round her a circle of learned companions. Here resided for a longer or shorter time Von Fürstenberg, Goethe, Jacobi, and others, but her most attached friends were Hemsterhuis and Hamann. She is the *Diotima* to whom the former of these, under the name of Dioklas, addressed his *Lettre sur l'Athéisme* (1785). She largely contributed to the conversion of Count Stolberg and his family to Roman Catholicism, and called forth that excess of religious feeling which for a considerable period characterised many circles of German society, and which Voss so sharply reproved in his *Wie ward Fritz Stolberg ein Unfreier* (How Fritz Stolberg became a Slave). The Princess Amalie died August 24, 1806.—Compare *Denkwürdigkeiten aus dem Leben der Fürstin Amalie von G.* (Münster, 1828).—7. Dimitri Augustine G., son of the foregoing, was born at the Hague, December 22, 1770. He became a Roman Catholic in his 17th year, shortly after his mother; and through the influence exercised over him by a clerical tutor during a voyage to America, he resolved to devote himself to the priesthood. In 1795, Dimitri Augustine was ordained a priest in the United States by Bishop Carroll of Baltimore, and betook himself to a bleak region among the Alleghany Mountains, in Pennsylvania, where he was known as 'Father Smith.' Here he laid the foundation of a town, called Loretto, which has now a population of 6000. He was austere as regards his personal mode of life, but liberal in the highest degree to others, and an affectionate and indefatigable pastor. He wrote various controversial works, some of which are still largely read in the United States. We may mention his *Defence of Catholic Principles*, *Letter to a Protestant Friend*, and *Appeal to the Protestant Public*. He died at Loretto, May 6, 1840.—8. Prince Emanuel G., born in Paris, 1804, studied in that city, and afterwards entered the Russian army. He translated into French Wrangel's book on Northern Siberia, and wrote an interesting work, entitled *La Finlande. Notes recueillies en* 1848 (2 vols., Paris, 1852). He died at Paris, February 1853.

GAMA, Dom Vasco da, the discoverer of the maritime route to India, was born, it is not precisely known when, at Sines, a small seaport of Portugal. He was descended of an ancient family, which was even supposed to have royal blood in its veins, though not legitimately. At an early period, he distinguished himself as an intrepid mariner; and after the return of Bartolommeo Diaz, in 1487, from doubling the Cape of Good Hope, King João, in casting about for a proper man to undertake the discovery of a southern passage to India, fixed on G., so great was the confidence which his abilities inspired. The intentions of João were frustrated by death; but his successor, Manoel the Fortunate, fitted out four vessels, manned altogether with 160 men, and intrusted them to the command of G., presenting him at the same time with letters to all the potentates whom it was thought likely he might require to visit; among others, one to the mythical 'Prester John,' then supposed to be reigning in splendour somewhere in the east of Africa. The little fleet left Lisbon 8th July 1497, but having been tormented by tempestuous winds almost the whole way, only arrived at the haven now known as Table Bay on the 16th of November, where they cast anchor for a few days. On the 19th November, G., after encountering a series of frightful storms, and being obliged to sternly suppress a mutiny among his terrified crew, who wanted him to return to Portugal, sailed round the southern extremity of Africa, and touched at various places on the hitherto unknown eastern coast of Africa. At Melinda, where he found the people far more civilised than he expected, he obtained the services of a well-educated pilot, a native of Guzerat, in India, who seemed familiar with the astrolabe, the compass, and quadrant. Under his guidance, G. struck out to sea, crossed the Indian Ocean, and arrived at Calicut, in India, on the 20th of May 1498. His reception by the ruler of Calicut (the 'Samudri-Rajah,' or Prince of the Coast, shortened into Zamorin) was not very favourable, nor did G.'s intercourse with him subsequently improve. The Arab merchants residing there were jealous of the new-comers, who might interfere with their monopoly of traffic, and incited the Hindus against them. Other complications also arose, and the result was that, on his departure, G. had to fight his way out of the harbour. Satisfied with the discoveries he had made, the Portuguese commander now turned his course homeward, touched at several of the places he had previously visited, and in September 1499, cast anchor at Lisbon, where he was received with great distinction. High-sounding titles were conferred on him. He was allowed the rare privilege of prefixing *Dom* to his name, and obtained a large indemnity for his trouble, besides certain monopolies in the commerce about to be opened with India. King Manoel immediately despatched a squadron of 13 ships, under Pedro Alvarez Cabral, to India, for the purpose of establishing Portuguese settlements in that country. In this they were successful only in a few places. At Calicut, forty Portuguese, who had been left behind, were murdered by the natives. To avenge this injury, and, more particularly, to secure the Indian Ocean commerce, the king fitted out a new squadron of 20 ships, which set sail under G.'s command in 1502. This fleet reached in safety the east coast of Africa, founded the Portuguese colonies of Mozambique and Sofala, which still exist, and sailed to Travancore. On his way, G. captured a richly laden vessel filled with Mussulmans from all parts of Asia, on their way to Mecca. He barbarously set it on fire; and the whole crew, amounting to about 300, were burned or slain, with the exception of some 20 women and children. What adds to the tragic character of this fearful incident is, that it occurred through a mistake. G. confounded these Asiatic followers of the Prophet with the Moors of Africa, the hereditary enemies of his nation, and proceeded to extremities on that assumption. On reaching Calicut, G., after a delay of a few days, bombarded the place, destroyed a fleet of 29 ships, and compelled the rajah to conclude a peace with suitable indemnification. If this act of vengeance or of punishment, executed as it was with prudence and determination, inspired the natives with fear of the power of the Portuguese, it contributed to confirm the alliances made with several of the native princes. So rapid had been G.'s proceedings, that before the close of December 1503, he was back in Portugal with 13 richly laden vessels. He was not, however, again employed for a period of 20 years; and it would appear that Manoel, for some reason or other, failed properly to appreciate his great services. Meanwhile, the Portuguese conquests in India increased, and were presided over by five successive viceroys, while G. was lying inactive at home. The fifth of these viceroys, however, was so unfortunate, that King João III., the successor of Manoel, was compelled to have recourse to the old hero; and in 1524, bearing the title of viceroy, G. set sail once more for the scene of his former triumphs with a fleet of 13 or 14 vessels. As he approached the coast of India, an unaccountable agitation of the water was observed by all. There was no wind to cause it, and the superstitious sailors were greatly alarmed. 'Why fear?' said G.: 'the sea trembles before its conquerors.' His firmness and courage succeeded in making Portugal once more respected in India; but while engaged in his successful schemes, he was surprised by death at Cochin, December 1525. His body was conveyed to Portugal, and buried with great pomp. In the character of G., resolution was found combined with prudence and great presence of mind. His justice, loyalty, honour, and religious fervour distinguished him above most of the great navigators and conquerors of his time. His discovery of a passage to India almost vies in importance with the discovery of America by Columbus, which took place only a few years before. Consult Barros, *Decades;* Castanpeda and Lafitau, *Hist. Conqu. Portug.;* and Cooley, *Hist. Mar. Discov.* His achievements are also celebrated by Camoens in the *Lusiad.*

GAMA GRASS (*Tripsacum*), a genus of Grasses, distinguished by unisexual flowers placed in spikes, which are fertile at the base, and barren towards the extremity, the spikelets having two glumes and about two florets, the female florets immersed in the thick and sinuous joints of the rachis, so that the spike, when the seed is ripened, presents the appearance of a cylindrical bone. Only two species are known, of which *T. dactyloides*, the Gama Grass of Mexico, distinguished by having spikes usually three together, has a high reputation as a fodder-grass, and is cultivated not only in Mexico, but in the United States of America, and now also to some extent in Europe. In favourable circumstances, it yields a very abundant crop, and attains a height of nine or ten feet, its root-leaves measuring six feet in length. It possesses what for some climates is an almost invaluable property of bearing excessive drought without injury. It suffers, however, from frost. It seems eminently adapted to the climate of the Australian colonies.—The other species, the Gama Grass of Carolina (*T. monostachyon*), distinguished by solitary spikes, is not so much esteemed. —Gama Grass is said to derive its name from a Spanish gentleman who first attempted its cultivation in Mexico.

GAMA'LIEL, the Greek form of the Hebrew name *Gamli'el* (*My rewarder is God;* or, *Mine also is God*), the most celebrated bearer of which is Gamaliel I., or the Elder (*hasaken*), probably the one mentioned in the New Testament (Acts, v. 34, and xxii. 3). Both here and in the Talmudical writings, he appears only in his capacity of a teacher of the law, and a prominent Pharisaic member of the Sanhedrim (q. v.); but of the circumstances of his life, or the date of his birth and death, we learn nothing from these, the only sources. He was the son of Simeon, the same, it may be assumed, who was first honoured by the title of Raban (our master)—a mark of distinction afterwards bestowed on Gamaliel himself—and thus the grandson of the celebrated Hillel. Whether (as would follow from Pesachim, 88 b.) he actually presided over the Sanhedrim (in the reigns of Tiberius, Caligula, and Claudius) or not, certain it is that the laws and ordinances which were issued by that body during his life bore the stamp of the all-embracing humanity and enlightened liberality which from the 'regal' House of Hillel was transferred to the School of Hillel—principally as opposed to the particularising and austere school of Shamai. To the refinement and erudition hereditary in his family—to which, alone, on account of its exalted position, even the otherwise strictly forbidden study of Greek science and philosophy had been allowed (cf. Derech Eretz, iv.)—G. appears to have added a rare degree of discretion, and of that practical wisdom which betimes revokes or adapts social laws, according to the wants of the commonwealth. For the benefit of sufferers of all kinds, that most stringent law of the limited Sabbath-day's journey was relaxed; the licence hitherto allowed to the absent husband, of annulling his letter of divorce (if he regretted his rashness), even after its delivery, before any court of two or of three men, was abolished (Gittin, 32); while, on the other hand, to prevent confusion, prepense or involuntary, the strictest accuracy with respect to the names of the husband, wife, and witnesses contained in these documents was most rigorously enforced. Again, the widow was to receive her marriage-portion (Kethuba) from the recalcitrant heirs, simply on her asseveration that she had not received it during her husband's lifetime: while formerly she had not been permitted to make oath even in the matter (Gittin, 34). But no less important, and testifying, at the same time, to a spirit free from prejudice, are the other laws respecting the treatment of the Gentiles, which may properly be ascribed to G.'s influence, if indeed they were not inaugurated by himself. Gentile and Jew, it was enacted, should henceforth, without distinction, be allowed the gleanings of the harvest-field; even on the day specially set aside to his idol-worship, the former should be greeted with the salutation of peace. Of his poor, the same care was to be taken; his sick were to be tended, his dead to be buried, his mourners to be comforted, exactly as if they belonged to the Jewish community (Gittin, 59 b., 61 ff.; Jer. Gitt. c. 5)—certainly no mean tribute to the principle of the equality of the human race, and a practical carrying out of Hillel's motto, the words of the Scripture (Lev. xix. 18), 'And thou shalt love thy neighbour as thyself' (cf. Sabbath, 30 b. ff.). The consideration of these and other legislative acts, all tending towards that social improvement and consolidation (*Tikkun Haolam*) which was G.'s avowed and acknowledged aim, seems also to set at rest that old and barren dispute, whether G., when he interposed on behalf of the apostles, and referred their matter to God himself, was secretly a Christian, or whether he was 'a cowardly tyrant, who even sought to withhold from them the privilege of martyrdom.' Tolerant, peaceful, as free from fanaticism on the one hand, as on the other from partiality for the new sect, which he seems to have placed simply on a par with the many other sects that sprang up in those days, and disappeared as quickly: he exhorts to long-suffering and good-will on all sides. Of his relation to St Paul, of the 'Law' he taught him (Acts, xxii. 3), as well as of the influence which his mind might have exercised over that of the 'apostle of the Gentiles,' we shall treat under the name of this latter.

When G. died (about seventeen years before the destruction of the Temple), 'the glory of the law' was said to have departed, and with him 'died the reverence before the law and the purity of *the abstinence*' (Pharisaism), (Sota, 49). His memory has always been held in the highest honour. The story of his conversion to Christianity, we need scarcely add, is as devoid of any historical foundation as that of the transmission of his bones to Pisa. In conclusion, it may be mentioned, that G. has been placed on the list of Christian Saints, and that his day is celebrated on the 3d of August.

GAMB, an heraldic corruption of the French word jambe, the leg. See Jambe.

GAMBA. See Viol di Gamba.

GA'MBESON, or **WAMBEYS**, a word of doubtful origin, implying a covering for the body, was the name of a thickly quilted tunic stuffed with wool, and worn by knights under the hauberk, as a padding for the armour. As it was sufficiently strong to resist ordinary cuts, it was sometimes worn without other armour. The surcoat was also quilted or *gamboised* with cotton wool, as in that of the Black Prince, still hanging above his tomb in Canterbury cathedral.

GA'MBIA, a river of Western Africa, whose basin, and that of the Senegal, constitute the region known as Senegambia, enters the Atlantic in lat. 13° 30′ N., and long. 16° 34′ W., after an estimated course of fully 1000 miles. It is four miles broad at its mouth, having a reach of double the width immediately inside. It is navigable for vessels of 150 tons up to Barraconda, a town on its right bank, about 200 miles from the sea.

GAMBIA, a British settlement occupying the banks of the river of the same name, as far up as Barraconda, though not continuously. The principal station, Bathurst, is situated on the island of St Mary, at the mouth of the Gambia. Other posts are Fort James and Fort George, the former also situated on St Mary's, and the latter on Macarthy's Island, 180 miles from the sea. Pop. of settlement in 1851, 5693, of whom 191 were whites. The climate is comparatively unhealthy. The export trade, already considerable, is steadily increasing, comprising chiefly wax, hides, ivory, gold dust, rice, palm-oil, horns, timber, and ground-nuts. The last-named article alone had augmented from 10,868 tons, value £130,496, in 1856, to 15,705 tons, value £188,464, in 1858. The foreign commerce with France, Great Britain, and the United States, respectively employs 12,500, 5500, and 3800 tons. In 1855 there were in this settlement seven schools, attended by 1349 pupils.

GA'MBIER ISLANDS, a Polynesian group, under a French protectorate, in lat. 23° 8′ S., and long. 134° 55′ W. They number five larger, and several smaller islands, all of coral formation. With the exception of Pitcairn's Island, they alone, on the route between Chili and Tahiti, yield good water in sufficient abundance for the supply of shipping.

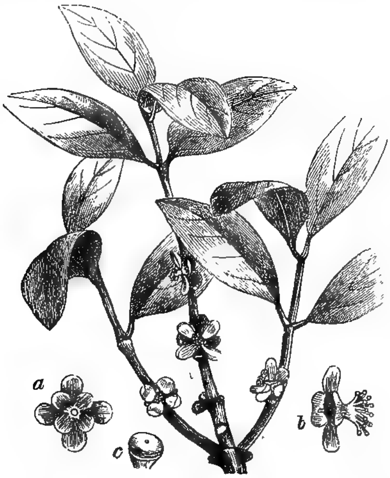
GA'MBIR, or **GAMBEER**, an astringent substance resembling Catechu (q. v.), and used for the same purposes. It is one of the most powerful of pure astringents. It is prepared from the leaves of the G. shrub, *Uncaria Gambir*, a native of the East Indies and Malay Archipelago. The genus *Uncaria* belongs to the natural order *Cinchonaceæ*. The G. shrub is very extensively cultivated in the Eastern Archipelago, great quantities of G. being used by the Malays for chewing with betel. G. is obtained by boiling or infusing the leaves in water, and evaporating either by the heat of a fire or of the sun. It is used in Europe both in medicine, and extensively in tanning. It is often called *Terra Japonica* in commerce. When examined by the microscope, it is found to consist in great part of a multitude of small crystals of *catechine*.

GAMBLING, or **GAMING**, the art or practice of playing a game of hazard, or one depending partly on skill and partly on hazard, with a view, more or less exclusive, to a pecuniary gain. Games of this nature were forbidden by the Romans both under the Republic and the Empire (Cic. *Philip.* ii. 23; *Dig.* ix. tit. 5; *Cod.* iii. tit. 43). The ground on which this was done was the tendency of such practices, not to demoralise the populace, but to render them effeminate and unmanly. Horace (*Carm.* iii. 24) complains that youths of condition, instead of riding and hunting, had betaken themselves to illegal games of chance. It belonged to the ædiles to attend to the public interest by punishing violations of the gaming laws. During the saturnalia, which was a period of general licence, these games were permitted (Martial, iv. 14), and a like indulgence at other seasons was extended to old men both amongst the Greeks and Romans (Eurip. *Med.* 67; Juv. xiv. 4). Nor has this vice been confined to civilised nations, either in the ancient or the modern world; Tacitus (*De Mor. Ger.* c. 2) mentions its existence amongst our own barbarian forefathers, and it is known to prevail amongst many half-civilised and even savage tribes at the present day. In general, it is resorted to as a refuge against the depressing sensations of languor and vacancy, which the want of active exertion causes in the minds of those who have no inner life; and the classes most addicted to it in all countries are the idle, and mere men of business in their idle hours.

It is remarkable that in England, as in Rome, the ground on which gambling was first prohibited was, not its demoralising, but its effeminating influences on the community. The act 33 Henry VIII. c. 9 (1541) has in view the double object of 'maintaining artillery and debarring unlawful games.' By 'artillery' appears to be meant archery, and the act, reciting two others in the same reign, proceeds on the preamble, that the skill of the people in this martial art 'is sore decayed, and daily is like to be more and more minished.' The cause of this degeneracy is stated to have been the practice among the people of 'many and sundry new and crafty games,' which not only diverted popular attention from the more manly and patriotic art of shooting with the bow, but gave rise to murders, robberies, and other felonies. The act then proceeds to make anxious provisions for the revival of the art of shooting with yew bows, and for the abolition of the said games—among which 'carding' is expressly mentioned—in any common house. On this act followed 16 Charles II. c. 7, and 9 Anne, c. 14, the latter of which declared that all bonds, or other securities given for money won at play, or money lent at the time to play with, should be utterly void, and all mortgages or encumbrances of lands made on the same consideration, should be made over to the use of the mortgager. This statute applied to Scotland, where the nullity was found to affect any one holding a bond or bill as trustee for the winner, but not onerous or *bonâ-fide* endorsers, without notice of the objection (Bell's *Com.* i. p. 28, Shaw's edition). Such continued to be the statute law till 1845, when there was passed the act 8 and 9 Vict. c. 109, which, though it repealed the obsolete provisions of 33 Henry VIII. and 16 Charles II. c. 7, entirely affirmed, and even extended the prohibitions of the former enactments against card-playing and other games in common houses, and other public places. By this statute, also, the common law of England was altered, and wagers, which, with some exceptions, had hitherto been considered legal contracts, were declared to be no longer exigible in a court of law. This prohibition, however, only applies to bets and wagers made on unlawful games. In Scotland, an opposite rule had been followed, the judges having held, irrespective of the character of the game, or of any statutory prohibition regarding it, that 'their proper functions were to enforce the rights of parties arising out of serious transactions, and not to pay regard to *sponsiones ludicræ.*' The partial assimilation which has now been effected in this respect between the laws of the two countries, is one the desirableness of which had been pointed out by many eminent English judges, from the time of Lord Mansfield down to the passing of the act, and which was at last adopted in accordance with the report of a select committee of the House of Commons in 1844. By this statute, it is also provided that cheating at play shall be punished as obtaining money under false pretences. It also facilitates proceedings against common gaming-houses, by enacting that where other evidence is awanting, it shall be sufficient to prove that the house or other place is kept or used for playing at any unlawful game, and that a bank is there kept by one or more of the players exclusively of the others; or that the chances of any game played therein are not alike favourable to all the players, including among the players the manager or managers of the bank. In order to constitute the house a common gaming-house, it is not necessary to prove that any person found playing at any game was playing for any money, wager, or stake. The police may enter the house on the report of a superintendent, and the authority of a commissioner, without the necessity of an allegation of two householders; and if any cards, dice, balls, counters, tables, or other instruments of gaming be found in the house, or about the person of any of those who shall be found therein, such discovery shall be evidence against the establishment until the contrary be made to appear. Those who shall appear as witnesses, further, are protected from the consequences of having been engaged in unlawful gaming. This enactment does not, of course, apply to the playing of games in private houses merely for purposes of amusement, even though a small pecuniary stake should be added to enhance the interest of the players; but where, from the heaviness of the stakes, and the systematic and repeated character of the playing, there could be no question that the crime of gambling was being committed in point of fact, the mere circumstance of the house being in other respects a private one, would not protect the players from the statutory penalties. In addition to the discouragement given to gambling in Scotland by the rule that bets and money gained at play could not be recovered by an action, it was also prohibited by statute. The act 1621, c. 14, enacts that playing in taverns is prohibited under a pecuniary penalty for the first offence, and a loss of licence for the second. Playing in private houses is also forbidden, if the master of the house do not play. This act, Mr Bell says, is not in desuetude (*Com.* i. p. 28), and the act of Anne, c. 14, in so far as not repealed, also applies to Scotland.

In most of the states of Germany, gaming is allowed, and the extent to which it is practised at the German watering-places is well known. The princes of the petty states often derive a large portion of their revenue from the tenants of their gaming establishments, whose exclusive privileges they guarantee. Abstracts of the laws of different countries relating to gaming were prepared by J. M. Ludlow, Esq., and laid before the select committee of the House of Commons. They will be found in a condensed form in volume 3 of the Political Dictionary of the *Standard Library Cyclopædia.*

GAMBO'GE, or CAMBOGE, a gum-resin, used in medicine and the arts, brought from the East Indies, and believed to be the produce chiefly of *Cambogia gutta,* also known as *Hebradendron gambogioides,* a tree of the natural order *Guttiferæ,* a native of Ceylon, Siam, Cambodia, &c. The gamboge-tree attains a height of forty feet, has smooth oval leaves, small polygamous flowers, and clustered succulent fruit. The fruit is about two inches in diameter, sweet and eatable, and is also much used as an ingredient in sauces. When the bark of the tree is wounded, G. exudes as a thick viscid yellow juice, which hardens by exposure to the air. Another species of the same genus (*C. pictoria*) occurs in the Mysore, and is believed to produce G. of similar quality. The finest G. comes from Siam.—*American G.*, which is very similar, and used for the same purposes, is obtained from *Vismia Guianensis*, a tree of the natural order *Hypericinæ*, a native of Mexico and Surinam.



Gamboge (*Hebradendron gambogioides*):
a, back view of a male flower; *b*, side view of male flower; *c*, an anther, with its umbilicate lid.

G. occurs in commerce in three forms: 1. in *rolls* or *solid cylinders;* 2. in *pipes* or *hollow cylinders;* and 3. in *cakes* or *amorphous masses.* The first two kinds are the purest. Good G. contains about 70 per cent. of resin and 20 per cent. of gum, the remainder being made up of woody fibre, fecula, and moisture. On evaporating to dryness the ethereal texture of the pure gum-resin, we obtain a deep orange-coloured or cherry-red substance, to which the terms *gambogic* and *gambodic acid* have been applied. Its composition is represented by the formula $C_{40}H_{23}O_8$, according to Johnston (*Phil. Trans.* 1839).

As the detection of G. in quack medicines, &c., is occasionally of great medico-legal importance (death having often taken place in consequence of the administration of Morison's pills and similar preparations), we may mention the following simple mode of procedure. Digest one portion of the suspected substance in alcohol, and another in ether. In each case, if G. is present, we obtain an orange-coloured tincture. The ethereal tincture dropped in water yields, on the evaporation of the ether, a thin, bright-yellow film of gambogic acid, which is soluble in caustic potash. The alcoholic tincture dropped into water yields a bright, opaque, yellow emulsion, which becomes transparent, and of a deep red colour, on the addition of caustic potash. On the addition of acetate of lead to either of these solutions, we have a yellow precipitate of gambogiate of lead; similarly, sulphate of copper yields a brown, and the salts of iron a dark-brown precipitate of the respective gambogiates of copper and iron.

In doses of a drachm, or even less, G. acts as an acrid poison, causing extreme vomiting and purging, followed by fainting and death. In small doses of from one to three grains, combined with aloes and ginger or aromatic powder, it may be given in case of obstinate constipation, in cerebral affections (as apoplexy, or where there is an apoplectic tendency), in dropsy (especially if connected with hepatic obstruction), and as a remedy for tape-worm. The use of G. is objectionable when there is an irritable or inflammatory condition of the stomach or intestines, or a tendency to abortion; and it is not very often prescribed by orthodox practitioners.

G. is much used by painters to produce a beautiful yellow colour. It is also employed for staining wood, and for making a gold-coloured lacker for brass. It has a shelly fracture, is destitute of smell, and has an acrid taste. It burns with a dense smoke and many sparks.

GAME. Certain wild animals are selected by what are called the game-laws from all other animals, and protected, for the exclusive benefit of those on whose lands they are found. Game-laws of one kind or another exist in all modern countries, and in recent times the tendency seems everywhere to be to render them more stringent. In ancient times, our kings distinguished themselves by the severity of the forest laws, from which the modern game-laws are descended; but the crown has now little to do with game, except where certain ancient forests, parks, and free warrens are to be found, and these continue to this day to be privileged places in many respects. The game-laws of England, Ireland, and Scotland are still quite distinct, and though in the most material parts they agree, yet there are several peculiarities to be attended to. The English statutes on the subject now in force are the Game Act 1 and 2 Will. IV. c. 32, and its amendments, 5 and 6 Will IV. c. 20, and 6 and 7 Will. IV. c. 65; the Night Poaching Act, 9 Geo. IV. c. 69, and its amendment, 7 and 8 Vict. c. 29; the Larceny Act, 24 and 25 Vict. c. 96; the Hares' Killing Act, 11 and 12 Vict. c. 29, and the Game Licenses' Acts, 23 and 24 Vict. c. 90, and 2 and 3 Vict. c. 35. These, however, only constitute the statute law on the subject, and there is interwoven with them the common law, both of which require to be taken together. Our present space precludes our giving more than the substance of the leading doctrines on the subject.

Blackstone laid down the doctrine, that at common law the sole right of hunting and killing game belonged to the crown, and that the subject could only claim this right by tracing title to the crown. This doctrine has, however, been clearly shewn to be erroneous, and Professor Christian was the first to point it out. It is now well settled that at common law the owner of the soil, or, if he has granted a lease without reserving the right, then the lessee or occupier, has the right to kill and catch every wild animal that comes on his lands. This is still the law, but the game-laws have made it necessary that the owner, or other person having the legal right, shall, before doing so, take out a game-licence —in other words, pay a tax to the state. Not only is a game-licence necessary in all cases, but there is a certain season, called the close season, during which it is unlawful for every person, whether having the legal right or not, to catch or kill game. Game is defined to include the following animals only—viz., hares, pheasants, partridges, grouse, heath-game, moor-game, black-game, and bustards. The close season applies only to the winged game, so that hares can be lawfully killed all the year round. But no game must be killed on Sundays or Christmas-day; to do so, subjects the offender to a penalty of £5. Though the above animals alone are game, the game acts also protect certain other animals—viz., woodcocks, snipes, quails, landrails, and conies; that is to say, any person illegally trespassing in pursuit of these may be fined £2. The eggs of game are also protected. In general, the game-laws consist merely of a net-work of penalties directed against these illegal trespasses, and these will be more properly stated under the head of POACHING (q. v.). Trespasses in the night-time, in pursuit of game, are punished more severely than those in the daytime; and when there are several persons acting together, exceeding five, the penalties are increased, and still more so when the poachers are armed with dangerous weapons, and use violence.

As between landlord and tenant, the general rule is, that, if there is no provision to the contrary in the lease, the tenant has the exclusive right to kill the game, and not the landlord; hence, the landlord, in order to preserve the right, must always introduce an express clause in the lease for his protection. When that is done, then the tenant may be punished like other persons for poaching. Formerly, it was attempted to protect lands against poachers by setting spring-guns and man-traps, and the English courts were inclined to hold this to be legal. But to put an end to all doubt, a statute was passed, and is now in force, which expressly prohibits spring-guns except to protect dwelling-houses (24 and 25 Vict. c. 100, s. 31).

In order to discountenance poaching, game is declared to be not a legal article of sale except by licensed game-dealers; this licence costs £2. The game-dealer can only buy his game from licensed sportsmen, and it is an offence for any of the public to buy game except from these licensed dealers, or to sell game without a licence; but sportsmen are not prohibited from making presents of game to any person.

As regards *game-licences*, these are now of two kinds: one is annual, and costs £3; the other lasts about half the year, and costs £2. A gamekeeper's licence costs £2. These licences are necessary, not merely to kill game, but also to kill deer, woodcocks, snipes, quails, landrails, and conies or rabbits. An exemption, however, exists, as regards hares and rabbits, when the owner or occupier kills these on his own enclosed ground, or directs another person to do so, in which case no licence is necessary; but this exemption only applies when the lands are enclosed or fenced, and the owner or occupier has otherwise the legal right to kill the hares and rabbits. No licence is required for merely hunting with staghounds, greyhounds, or beagles, or killing deer in one's own park. Moreover, attendants or friends going out with licensed sportsmen, provided these merely assist, and do not play a principal part, do not require a licence. But in all other cases it requires a licence, not only for killing, but for pursuing game, or even for lifting and taking away dead game from a highway or field. Assessed taxes must also be paid for dogs—viz., for each dog 12*s*. See on the foregoing subjects, Paterson's *Game-laws of the United Kingdom.*

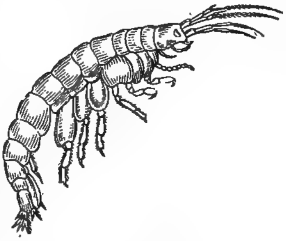
The policy of the game-laws has often been questioned. Mr Bright obtained a committee of the House of Commons in 1845, who examined the subject. These laws are represented, on the one hand, to be far too stringent, to be badly administered by interested justices, and, lastly, to be opposed to the moral sentiments of the lower orders, who persist in treating such offences as venial, if not praiseworthy. On the other hand, owners of land say that they are entitled to protection against trespassers, and this is the only way by which they can be protected.

In Scotland, several of the foregoing statutes, such as the Night Poaching Act and the Game Licences' Act, also apply. There is a similar act as to day-poaching—viz., 2 and 3 Will. IV. c. 68, and as to hares, 11 and 12 Vict. c. 30. The provisions in the English act as to game-dealers and the sale of game also apply. But in Scotland, not only a game-certificate, but a qualification, is requisite to enable a person to shoot, except he has the permission of a qualified person. So it is in Ireland, but not in England. In Scotland, the close season differs slightly from that of England, and so does the definition of game. The law as between landlord and tenant is also so far different, that the presumption is the reverse in Scotland; for if nothing is said in the lease, the right to the game belongs to the landlord, and not to the tenant. A tenant has also a right of action against the landlord for excessive preserving, if extraordinary injury is thereby done to his crops—a right which does not exist in England or Ireland. See Paterson's *Game-laws*, Irvine's *Game-laws.*

In Ireland, the law is nearly the same in substance with that of England; but there are distinct statutes and minor differences as to the qualification to kill game, as to the definition of game, of close-time, &c. See Paterson's *Game-laws*, Levinge's *Game-laws.*

GAMMA, GAMME, or **GAMMUT,** the name given to the system of musical notation invented by Guido, the first note of which he called by the Greek letter Gamma. Later, the whole scale got the name of Gamma, but it afterwards fell into disuse with Guido's Solmisation. In modern music, the term is applied to the scale or compass of wind instruments.

GA'MMARUS, a genus of *Crustacea* of the section *Edriophthalma* (q. v.), and order *Amphipoda*, of which one species, *G. pulex*, is extremely common in springs and rivulets in Britain, particularly where decaying vegetable matter has accumulated. It generally keeps near the bottom; swims on its side, with a kind of jerking motion, and feeds on dead fishes or any other animal matter. It is sometimes called the Fresh-water Shrimp.



Fresh-water Shrimp (*Gammarus pulex*), magnified.

GAMRUN. See GOMBROON.

GAND. See GHENT.

GA'NDIA, a beautiful town of Spain, in the province of Valencia, and 34 miles south-south-east of the town of that name, stands on the left bank of the Alcoy, about two miles from the sea. It is well built, with streets regular and spacious; is surrounded with walls and towers, has numerous ecclesiastical edifices, and a magnificent ducal palace, adorned with gilding and *azulejos* or coloured tiles. Its gardens are fertile and luxuriant beyond description. It has manufactures of linen, woollen, and silken fabrics, and a trade in rice, hemp, silk, and timber. Pop. 6000.

GANDO. 1st, A kingdom or empire of Súdan, situated on both sides of the Niger. It is bounded on the north-west by the empire of Songhay, and on the south-east by the empire of Sókoto. It consists of the provinces of Western Kebbi, Maúri, Zabérma, Déndina, parts of Gurma, Borgu, and Yoruba, Yaúri, and Núpe. The country is fertile, and the vegetation in many places luxuriant. The principal productions are the yam, the date, and the banana. The inhabitants are of the Fulah (q. v.) race, and mostly Mohammedans. When Dr Barth visited G. in 1853, the monarch or sultan was Khalílu, nephew of the great reformer Imâm Othman (see Fulah). He is described by that traveller as a 'man without energy, and most inaccessible to a European and a Christian'—living, in fact, in a state of monkish seclusion, and employing a younger brother to 'keep up a certain show of imperial dignity.' It is not surprising that under such a ruler Dr Barth should find 'most of the provinces plunged into an abyss of anarchy.'—2d, Gando, a city, and capital of the above kingdom, lies in a narrow valley, surrounded and commanded by hilly chains. 'It is intersected,' says Dr Barth, 'from north to south by the broad and shallow bed of a torrent, which exhibited fine pasture-grounds of fresh succulent herbage, while it was skirted on both sides by a dense border of luxuriant vegetation, which altogether is much richer in this place than either in Sókoto, or Wurno, being surpassed only by the fine vegetable ornament of Kano.' The interior of the place is very pleasant and animated, and the inhabitants are industrious and successful in the manufacture of cotton cloth.

GANDOLFO. See Castel-Gandolfo.

GANGA, or SAND-GROUSE (*Pterocles*), a genus of gallinaceous birds, of the family *Tetraonidæ*, closely allied to grouse and ptarmigan, but distinguished by a pointed tail. The toes are not feathered. The species are natives chiefly of the warm parts of Asia and of Africa, and are most abundant in arid sandy plains. Two species, the Banded Sand-grouse (*P. arenarius*) and the Pin-tailed Sand-grouse (*P. setarius*), are found in the south of Europe. The latter species is very abundant on the arid plains of Persia. In Europe, it is found as far north as the south of France, chiefly in the sterile *Landes*. It is always to be seen in the markets of Madrid. The Banded Sand-grouse is abundant on the vast steppes of the south of Russia. The African species of this genus are often to be seen in large flocks near places to which they resort to drink.

GANGA SAGOR, a low swampy island at the mouth of the great western or holiest branch of the Ganges, particularly sacred in the estimation of the Hindus. Multitudes of pilgrims annually resort to it, at the time of full moon, in November and in January. Infanticide formerly took place to a vast extent at these festivals, but is now prohibited by the British government.

GA′NGES, a river prominent alike in the religion and in the geography of the East, divides, at least towards the sea, India in its largest sense into the two grand divisions of *Hither* and *Farther*. Its entire length is more than 1500 miles. Its general direction during the first half of its course is south-east; it then flows east through the plain of Bengal, as far as Rajmuhal, a distance of about 400 miles, after which it again proceeds in a south-eastern direction, and enters the sea through a multitudinous delta. For the purposes of detailed description, the stream, which exhibits such a great variety of phases in the different parts of its course may be conveniently broken down into five sections: (1) from its springs to Gangotri; (2) from Gangotri to Hurdwar; (3) from Hurdwar to Allahabad; (4) from Allahabad to Seebgunge, or the head of the Delta; (5) from Seebgunge, or the head of the Delta, to the Bay of Bengal.

From its Springs to Gangotri.—The Bhageerettee, Bhagirathi, or Bhaghireti, generally regarded as the true G., rises in Gurhwal, near lat. 30° 54′ N., and long. 79° 7′ E., from a snow-field imbedded between three mountains of about 22,000 feet in height. The actual spot from which it is seen to issue is itself 13,800 feet above the sea. After a course of ten miles, throughout which the torrent is all but inaccessible, it reaches the temple of Gangotri, the first work of man on its banks, at an elevation of 10,300 feet, so as to have descended about 350 feet in a mile.—*From Gangotri to Hurdwar.*—After a run of seven miles, the stream is joined on the right by the Jahnuvi, considerably larger than itself, in lat. 31° 2′ N. and long. 78° 54′ E.; and the united waters, 13 miles further down, burst through the Himalaya Proper, in lat. 30° 59′ N., and long. 78° 45′ E. Still 90 miles lower, it receives the Aluknanda with a volume one half greater than its own, and here it first receives the name Ganges. A distance of 47 miles more carries the still rapid current down to Hurdwar, on the verge of the great plain of Hindustan, at an elevation of 1024 feet, shewing a descent of 9276 feet in 157 miles, or of nearly 60 feet in a mile.—*From Hurdwar to Allahabad.*—This portion of the river, measuring 488 miles, and averaging a fall of 22 inches in a mile, is beset almost throughout by shoals and rapids. It is navigable, however, for river-craft the whole way to Hurdwar, for passenger-steamers to within 100 miles of the mountains, and for loaded barges up to Cawnpore, which is 140 miles above Allahabad. This last-mentioned city stands at the confluence of the G. and the Jumna.—*From Allahabad to Seebgunge, or the head of the Delta.*—This, the longest of the five divisions of the stream, measures 563 miles in length, and has a fall of about five inches in a mile. Notwithstanding many shoals, it is practicable throughout, even in the driest season of the year, for vessels drawing fully 18 inches. About 270 miles below Allahabad, the G. is joined on the left by the Ghogra, having previously received the Gumti on the same side, and the Tons and the Kurumnassa on the right. About half-way between Allahabad and the Ghogra is the city of Benares. Between the Ghogra and Seebgunge, the principal affluents are the Sone on the right, and the Gunduk and the Coosy or Sun Kosi, on the left. Along this entire section, the G. varies largely both in breadth and in depth, according to the season of the year and the state of the water.—*From Seebgunge, or the head of the Delta, to the Bay of Bengal.*—Here the descent, along a line of 283 miles, averages about three inches in a mile. Hitherto swollen by its feeders, the G. now begins to send off branches, parting at Seebgunge with the Bhagrutti, and next, 70 miles further down, with the Jellinghi, at the town of the same name, which, after separate courses of about 120 miles each, unite to form the Hoogly of Calcutta. Below the point of departure of the Jellinghi, it throws out similar offsets, the Marabhanga, the Gorae, the Chundni, and the Kirtynassa. Meanwhile, this waste towards the right is in a great measure compensated by affluents on the left, more especially by various channels of the Brahmaputra—the two great net-works of waters intertwining themselves together in a manner too complex for delineation, and at last indenting a long line of coast with at least 20 estuaries. The mouth of the Hoogly, the most available of all the branches of the G. as the means of communicating with the outside world, is in lat. 21° 40′ N., and long. 88° E. By it the largest ships reach Diamond Harbour, while vessels of considerable burden ascend to Chandernagore. Between the Hoogly and the G., above the Delta, there are two routes. When the water is high, the Bhagrutti and the Jellinghi afford the requisite facilities; but in the dry season, the intercourse is maintained by the Sunderbund or Sunderbans Passage, a circuitous course to the north-east, which opens into the Chundni.

As a whole, however, the G. is incapable of being definitely described. It varies not merely from season to season, but also from year to year. From year to year it exchanges old passages for new ones, more particularly in the alluvial basin of its lower sections. Even as far up as Futtehpore, immediately above Allahabad, this characteristic is remarkably exemplified. The river has in this part a bed of the average width of four miles, within the limits of which it changes its course annually, in the lapse of four or five years shifting from the one limit to the other. Between season and season, again, the fluctuations are still more conspicuous. To take Benares as an instance, the stream ranges, according to the time of the year, from 1400 feet to 3000 feet in breadth, and from 35 feet to 78 feet in depth. Lower down, the vicissitudes, without being more striking in themselves, produce more striking results. About the close of July, a considerable proportion of the Delta forms an inundation of more than 100 miles in diameter, presenting nothing to the eye but villages and trees, and craft of every sort. To prevent or mitigate this evil, expensive dams have been constructed, having collectively a length of above 1000 miles. The influence of the tides extends, at the dry season, a distance of 240 miles from the sea. The minimum quantity of water delivered per second has been estimated at 36,330 cubic feet, and the maximum at 494,208 cubic feet. Like all rivers that overflow their banks, the G. holds in suspension a large admixture of mud and sand—foreign elements eminently unfavourable to steam-navigation, as causing quick wear and decay of the cocks and valves of the engines. It has been computed that it delivers, on an average, annually into the sea 534,600,000 tons of solid matter.

Amongst the rivers which at the *classical* and the *Paurânic* period of India were held in peculiar sanctity by the nation, the G.—or, as it is called, the *Gangâ* (feminine)—undoubtedly occupied the foremost rank. In the vedic poetry, it is but seldom mentioned; and whenever its name occurs, whether in the hymns of the *Rigveda* or the ritual text of the *Yajurveda*, no legendary fact or mythical narrative is connected with it. Nor does the law-book of Manu justify the conclusion that its author was acquainted with any of the myths which connect this river in the epic poems and in the Purânas with the Pantheon of India. The earliest, and by far the most poetical legend of the G., occurs in that master-piece of Sanscrit poetry, the *Râmâyana*. We give its substance, because it explains the principal epithets by which this river is spoken of, or invoked, in ancient and modern Hindu poetry, and because it may be looked upon as the type of the many fables which refer to the purifying and supernatural properties of its waters. There lived, says the *Râmâyana*, in Ayodhyâ (the modern Oude), a king, by the name of Sagara, who had two wives, Kesinî and Sumati; but they bore him no issue. He therefore repaired to the Himalaya; and after a hundred years' severe austerities, Bhrigu, the saint, became favourable to his wishes, and granted him posterity. Kesinî bore him a son, who was named Asamanjas, and Sumati brought forth a gourd, whence sprang 60,000 sons, who in time became as many heroes. Asamanjas, however, in growing up, was addicted to cruel practices, and was therefore banished by his father from the kingdom. His son was Ansumat, who thus became heir to the throne of Ayodhyâ. Now, it happened that Sagara resolved to perform a great horse-sacrifice; and in accordance with the sacred law, chose for this purpose a beautiful horse, which he confided to the care of Ansumat. But while the latter was engaged in the initiatory rites of the sacrifice, a huge serpent emerged from the soil, and carried off the horse to the infernal regions. Thereupon, Sagara, being informed of the obstruction which had befallen his pious undertaking, ordered his 60,000 sons to recover the horse from the subterranean robber. These then set to work, digging the earth, and striking terror into all creation. Having explored, for many years, the infernal regions, they at last found the sacred horse grazing, and watched by a fiery saint, in whom they recognised the serpent, the cause of their troubles. Enraged, they attacked him; but the saint, who was no other being than Vishnu, at once reduced them to ashes. Waiting in vain for the return of his sons, Sagara sent his grandson, Ansumat, in search of them and the sacred horse. Ansumat went, and soon ascertained the fate of his relatives; but when—mindful of his duties—he wished to sprinkle consecrated water on their ashes, so as to enable their souls to rise to heaven, Garuda, the bird of Vishnu, and brother of Sumati, came in sight, and told Ansumat that it was improper for him to use terrestrial water for such a libation, and that he ought to provide the water of the Gangâ, the heavenly daughter of Himavat (the Himalaya). Ansumat, bowing to the behest of the king of birds, went home with the horse to Sagara; and the sacrifice being achieved, Sagara strove to cause the descent of the Gangâ, but all his devices remained fruitless; and after 30,000 years, he went to heaven. Nor was Ansumat more successful in his attempt with the austerities he performed for the same purpose, nor his son Dwilîpa, who, obeying the law of time, after 30,000 years, went to the heaven of Indra. Dwilîpa had obtained a son, named Bhagîratha. He, too, was eager to obtain the descent of the Gangâ; and having completed a course of severe austerities, he obtained the favour of Brahman, who told him he would yield to his prayers, provided that Siva consented to receive the sacred river on his head, as the earth would be too feeble to bear its fall when coming from heaven. And now Bhagîratha recommenced his penance, until Siva consented, and told the Gangâ to descend from heaven. The river obeyed; but, enraged at his command, she assumed a form of immense size, and increased her celerity, thinking thus to carry him off to the infernal regions. Yet the god becoming aware of her intentions, caught and entangled her in his matted hair, out of which she could find no means of extricating herself though erring there for many years. Nor would she have been released, had not Bhagîratha, by his renewed penance, appeased the god, who then allowed her to descend from his head in seven streams—Hlâdinî, Pâvinî, and Nalinî, which went eastwards; and Sîtâ, Suchakshus, and Sindhu, which went westwards, whilst the seventh stream followed Bhagîratha wherever he proceeded. But it so happened that the king on his journey passed by the hermitage of an irascible saint whose name was Jahnu. The latter seeing the Gangâ overflooding in her arrogance the precincts of his sacrificial spot, and destroying his sacred vessels, became impatient, and drank up all her waters; thereupon all the gods became terrified, and promised him that, in future, the Gangâ would pay him filial respect, and become his daughter, if he would restore her again to existence. Quieted by this promise, Jahnu then allowed her to flow out from his ear, and therefore she is still called Jâhnavî, or the daughter of Jahnu. But, because Bhagîratha, by dint of his exertions, enabled his ancestors, now sprinkled with the waters of the Gangâ, to ascend to heaven, Brahman allowed him to consider her as his daughter, whence she is called Bhâgirathî. And she is also called the river of 'the three paths,' because her waters flow in heaven, on earth, and pervaded the subterranean regions.—Such is the account of the *Râmâyana*, and its substance is repeated by the *Mahâbhârata* and several of the Purânas, though they differ in the names of the streams formed in her descent by the Gangâ, some (for instance, the *Vishnu-* and *Vâyu-Purâna*) restricting their number from seven to four, called by the *Vishnu-Purâna* Sîtâ, Alakanandâ, Chakshu, and Bhadrâ. A further deviation from the original myth was caused by sectarian influence; for, whereas in the *Râmâyana*, the Gangâ springs from the Himavat (Himalaya), whose daughter, therefore, she is, and whereas Siva plays the most prominent part in her descent to earth, the *Vishnu-Purâna* assigns her source to the nail of the great toe of Vishnu's left foot, and allows Siva merely to receive one of her branches on his head. The following passage from this Purâna will shew the ideas of the Vishnuite sect on the history and the properties of this river: 'From that third region of the atmosphere, or seat of Vishnu, proceeds the stream that washes away all sin, the river Gangâ, embrowned with the unguents of the nymphs of heaven, who have sported in her waters. Having her source in the nail of the great toe of Vishnu's left foot, Dhruva (Siva) reverses her, and sustains her day and night devoutly on his head, and thence the seven Rishis practise the exercises of austerity in her waters, wreathing their braided locks with her waves. The orb of the moon, encompassed by her accumulated current, derives augmented lustre from her contact. Falling from on high, as she issues from the moon, she alights on the summit of Meru, and thence flows to the four quarters of the earth, for its purification. The Sîtâ, Alakanandâ, Chakshu, and Bhadrâ, are four branches of but one river, divided according to the regions towards which it proceeds. The branch that is known as Alakanandâ was borne affectionately by Siva, upon his head, for more than a hundred years, and was the river which raised to heaven the sinful sons of Sagara by washing their ashes. The offences of any man who bathes in this river are immediately expiated, and unprecedented virtue is engendered. Its waters, offered by sons to their ancestors in faith for three years, yield to the latter rarely attainable gratification. Men of the twice-born orders, who offer sacrifice in this river to the lord of sacrifice, Pumshottama, obtain whatever they desire, either here or in heaven. Saints who are purified from all evil by bathing in its waters, and whose minds are intent on Kesava (Vishnu), acquire thereby final liberation. This sacred stream, heard of, desired, seen, touched, bathed in, or hymned day by day, sanctifies all beings; and those who, even at a distance of a hundred leagues, exclaim "Gangâ, Gangâ," atone for the sins committed during three previous lives.' How far the belief expressed in the latter passage was carried at a period probably succeeding that of the composition of the *Vishnu-Purâna* may be seen from a legend which occurs in the *Kriyâyogasâra*, the sixth division of the *Padma-Purâna*. This Purâna relates that a king, Manobhadra, having grown old and weak, resolved upon dividing his kingdom between his two sons. He therefore convoked a council of his ministers, when, of a sudden, a vulture and his mate flew into the hall, to the surprise of the whole assembly. Questioned about the purpose of their visit, they replied that, having witnessed the evil luck of the two princes in a former birth, they now came to rejoice in their happiness. The king's curiosity having been roused, the male vulture then said, that in the age called Dwâpara, the two princes had been two men of low caste, called Gara and Sangara, and when dead, were brought before Yama, the judge of the dead, who sentenced them to be thrown into a fearful hell. Their lives had indeed been faultless; no sin had been committed by them, but whenever they gave alms, they did not offer them to a Brâhmana, and thus robbing the latter of the property which otherwise would have come to him, they became candidates for hell. He, the vulture, had come to the same place, because, when being a noble Brâhmana, Sarvasa, he slighted his parents. Now the period of their sentence having expired, he was reborn as a member of the vulture tribe, which is living on the flesh of the dead, whereas they became a couple of locusts. Once, however, a hurricane arose, and threw the locusts into the Ganges; there they died; but having found their death in the water of the river which destroys all guilt, the servants of Vishnu came with heavenly chariots to conduct them to his town. Having stayed there up to the end of the third Kalpa, they were bidden by Brahman to enjoy themselves in the paradise of Indra; and after a certain time they were reborn in the family of Manobhadra, ultimately to rule his country. All the hymns addressed to the Ganges —and a remarkable one occurs in the same division of the *Padma-Purâna*—partly allude to the legends mentioned before, or to other feats of purification worked by the sacred water of this river. Its efficacy is deemed, however, greatest at the spot where the Ganges joins the Yamunâ, or Jumna, at Allahabad, and—the latter river having previously received the Saraswati below Delhi—where in reality the waters of the three sacred rivers meet. In some representations of Siva, the Gangâ is seen in his hair, and the river issuing from her mouth; she is also pictured, as Moor tells in the *Hindu Pantheon*, as part of the *Trivenî* or sacred triad of the rivers just named, when she is white, and bears the forehead mark of Siva; on her right is Saraswatî, red, and with a roll of paper in her hand; on her left, Yamunâ, as Lakshmî, the deity of this river, blue, and holding a golden jar. The whole group is riding on a fish; the fish, the clothing of the goddesses, and the glory encircling their heads, being of gold.—Gangâ is also considered as the mother of the god of war. See Kârtikeya.

GANGES CANAL, a modern imitation, in some measure, of the more ancient works of the kind on the Jumna (q. v.), has two main objects in view—the irrigating of the Doab, and the avoiding of the difficulties in the navigation of the river above Cawnpore. Extending, on the right of the Ganges, from Hurdwar to the city last mentioned, it measures, including its branches, 810 miles—350 for the trunk, and 460 for the offsets. In its course, it crosses the Solani on perhaps the most magnificent aqueduct in the world. This noble work, erected at a cost of £300,000, consists of fifteen arches, each having a span of 50 feet; while the piers, sunk 20 feet below the bed of the stream, are protected on every side against the force of the current by ingeniously compacted masses of piles and stones.

GANGLION, in Anatomy. See Brain and Nervous System.

GANGO'TRI, a temple erected on the highest accessible spot on the Ganges (q. v.), about 10,000 feet above the level of the sea, stands on the right bank of the river, here called the Bhagirathi, about ten miles from its source. Immediately in front, the stream expands into a small bay, which is subdivided into pools, taking their names respectively from Brahma, Vishnu, and other gods of the native mythology. Though the water is specially sacred, and ablution peculiarly efficacious, yet, from various causes, the pilgrims are by no means numerous. Besides the length and ruggedness of the journey, and the difficulty of procuring subsistence by the way, there is no accommodation for visitors, the only dwelling-house in the locality being occupied by the officiating Brahmans. Superstition, however, has found a remedy in the exportation of flasks of the holy element, sealed by the attendant priests.

GA'NGRENE, the loss of vitality in a part of the living body, whether external or internal, the part becoming often, in the first instance, more or less red, hot, and painful, then livid, and finally dark and discoloured, black or olive-green, according to circumstances, and putrescent; after which a separation takes place gradually between the living and dead parts, and if the patient survive, the disorganised and lifeless texture is thrown off, and the part heals by the formation of a Cicatrix (q. v.) or scar, indicating the loss of substance. Gangrene is an occasional consequence of Inflammation (q. v.), but is often also determined by more specific causes, such as Typhus Fever or Erysipelas (q. v.); sometimes, also, by the action of poisons on the system, and not unfrequently by disease or obstruction of the arteries of a part. This last is especially the case in the form called senile gangrene. Gangrene admits only to a slight extent of medical treatment; but there is sometimes a necessity for surgical interference, to preserve a useful stump, or to arrest bleeding. Generally speaking, the strength must be maintained by a nourishing but not too stimulating diet, and the part carefully preserved from external injury, and from changes of temperature.

GA'NGWAY (Saxon, *gangweg*), the entrance to a ship. There is a gangway on each side, consisting of steps or cleats nailed to the planks of the side, up which, by aid of a rope, it is necessary to climb. When, however, a vessel is in harbour, a portable flight of steps, called an accommodation-ladder, is usually hoisted out, by which the ascent is sufficiently easy.

GAN-HWUY, or **NGAN-HOEE**, one of the five eastern provinces of China Proper. It is intersected by the Yang-tze-kiang, on which river its capital, Gan-king-foo, is situated. In the south-eastern parts of the province are some extensive tea-plantations, and it also produces rice, grain, and a limited quantity of silk. Pop. according to the census of 1812, 34,168,059; area, 48,461 square miles.

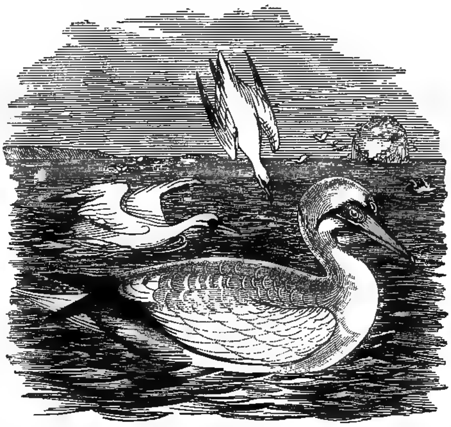
GANJA'M, a town in the sub-presidency of Madras, stands on the left bank of the Rosikoila, immediately above its entrance into the Bay of Bengal, in lat. 19° 23′ N., and long. 85° 7′ E. It was once the capital of the district of its own name, and was remarkable for its fine buildings. But in 1815, when the town was visited by deadly fevers and agues, all the public establishments were removed to Chicacole (q. v.); the fort and cantonments gradually fell into ruin, and the place sank into decay.

GANJAM, the district mentioned in the preceding article, lies on the north-west coast of the Bay of Bengal, immediately to the south of Cuttack, stretching in N. lat. from 18° 13′ to 19° 52′, and in E. long. from 83° 50′ to 85° 15′, and containing 6400 square miles, and 926,930 inhabitants. The chief products are rice, maize, sugar-canes, millet, pulse, oil-seeds, wax, gums, dye-stuffs, and arrowroot. On the northern boundary is the salt-lake Chilka, 42 miles long, 15 broad, and only 6 feet deep. The country does not offer a single haven to ships of any burden. Small vessels, however, may enter the Rosikoila.

GANJEH. See Elizabetopol.

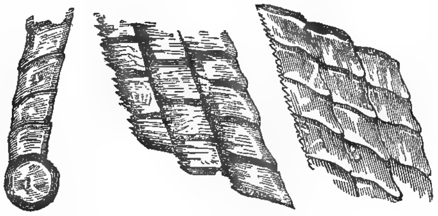
GANNAT, a town of France, in the department of Allier, is pleasantly situated on the Andelot, a tributary of the Allier, amid hills covered with vines and timber trees, 34 miles south-south-west of Moulins. In former times, it was fortified by walls and ditches, the latter being supplied with water by the stream on which the town stands. G. has tanneries and breweries, and a trade in corn, wine, and cattle. Pop. 5055.

GANNET (*Sula*), a genus of web-footed birds, of the family *Pelecanidæ*, having a long, strong, conical bill, the face and throat naked, the feet with four toes, three before and one behind, all united by the web. To this genus the Booby (q. v.) belongs. Another species is the Common G., or Solan Goose (*S. Bassana*), a bird which breeds on insular rocks in the northern seas, and migrates in winter to warmer and even tropical regions. The name *Solan* or *Soland* Goose is from *Solent*, an old name of the English Channel. The entire length of the G. is about three feet; its general colour milk-white, the crown and back of the head pale yellow, the quill-feathers of the wings black. The G. lays usually a single egg, of a chalky white colour; the young bird, when newly hatched, has a naked bluish-black skin, but soon becomes covered with a thick white down, so that it resembles a powder-puff, or a mass of cotton; and when the true feathers appear, they are black, with lines and spots of dull white, so that the plumage of the young is very unlike that of the mature bird. The G. is long-lived, and takes about four years to come to maturity. Its motions on land are very awkward; but it is a bird of very powerful wing and graceful flight. It extends its flight to great distances from the rocks which it inhabits, pursuing shoals chiefly of such fish as swim near the surface, particularly herring, pilchards, and others of the same family. The presence of a shoal of pilchards often becomes known to the Cornwall fishermen from the attendant gannets. The G. may often be seen sailing in


Common Gannet, or Solan Goose (*Sula Bassana*).

the air, when suddenly, seeing a fish, it falls, with unerring precision, perpendicularly upon it. Gannets are sometimes taken by means of a board with a fish fastened to its upper surface, made to float a little beneath the surface of the water, the force with which the bird falls being sufficient to drive its sharp bill through the board, from which it cannot draw it back. Lundy Isle, the Bass Rock, Ailsa, St Kilda, and Suliskerry, are the most celebrated British breeding-places of gannets. The number of gannets that annually visit the Bass Rock in the Firth of Forth is estimated at nearly twenty thousand. The young are killed chiefly for the sake of their feathers, which bring a good profit to the person who rents the rock. There, and in similar localities, they are to be seen in prodigious numbers, the air around the rock being filled with them, like bees around a hive, and the rock itself whitened by them and their accumulated excrements. Their nests are formed of sea-weeds and marine grasses. On Great Gannet Rock, near the coast of Labrador, they are described as placed in regular rows. From this rock, great numbers of gannets are taken to be cut into bait for the cod-fisheries. The G., during incubation, will often allow itself to be touched with a stick without rising from the nest. Its flesh is rank and oily, but edible; but that of the young baked, is eaten to a considerable extent in many places, and is even reckoned as a delicacy. The eggs are considered by many connoisseurs to be a decided delicacy. They are boiled for twenty minutes, and eaten cold, with vinegar, salt, and pepper. The voice of the G. is harsh, and the cries of the multitudinous birds, when disturbed at their breeding-places, are deafening.—A species of G. (*S. variegata*), extremely abundant in some parts of the southern hemisphere, is said to be the chief producer of guano.

GA'NOID FISHES, one of the four orders of fishes in the classification of Agassiz, characterised by *ganoid* scales—shining scales (Gr. *ganos*, splendour), covered with enamel, angular, either rhomboidal or polygonal. Ganoid scales are often large, thick, and bony; they are usually placed in oblique rows, and united to each other by a kind of hook at the anterior angle. Recent ganoid fishes do not form a natural group, but differ in very important parts of their organisation. Some of them have an osseous, some a cartilaginous skeleton. Recent ganoid fishes are, however, comparatively few; whereas, among fossil fishes, the ganoid type is extremely prevalent. The sturgeon is an example of a ganoid fish.



Various forms of Ganoid Scales.

GA'NTLET, or **GAUNTLET** (Fr. *gant*, a glove), an iron glove, which formed part of the armour of knights and men-at-arms. The back of the hand was covered with plates jointed together, so as to permit the hand to close. Gantlets were introduced about the 13th century. They were frequently thrown down by way of challenge, like gloves. They are frequently used in heraldry, the fact of their being for the right or left hand being expressed by the words 'dexter' or 'sinister.'

In the phrase 'to run the gantlet,' the word is probably a corruption for *ganglope* (from *gang*, a passage, and the root occurring in e-*lope*—*D. loopen*, Ger. *laufen*, to run). The German has *gassenlaufen* (lane-run), meaning a military punishment, which consists in making the culprit, naked to the waist, pass repeatedly through a lane formed of two rows of soldiers, each of whom gives him a stroke as he passes with a short stick or other similar weapon.

GANTUNG PASS, in lat. 31° 38′ N., and long. 78° 47′ E., leads eastward from Kunawar, a district of Bussahir in Hindustan, into Chinese Tartary. Its height is 18,295 feet above the sea, and it is overhung by a peak of its own name, about 3000 feet loftier. The place is unspeakably desolate and rugged. It is, of course, beset with perpetual snow, and being devoid of fuel, it is but little frequented. Gerard, one of the few travellers that have visited it, crossed it—and that in July—amid snow and sleet. One peculiarity in the scene, according to the traveller just mentioned, is that the whitened surface presents here and there dangerous pools of still water.

GANYME'DES, the cup-bearer of Zeus, was, according to Homer, the son of Tros, or, according to others, of Laomedon, Ilus, or Erichthonius. The most beautiful of mortals, he attracted the notice of the king of the gods, who despatched his eagle to carry him off to heaven, where he succeeded Hebe in the office above referred to. The Greeks believed that Zeus gave Tros a pair of divine horses as a compensation for kidnapping his boy, and comforted him at the same time by informing him that G. had become immortal and free from all earthly ills. At a later period, G. was identified with the divinity who presided over the sources of the Nile. The Greek astronomers likewise placed him among the stars, under the name of Aquarius (the water-bearer), in allusion to his celestial function. He was also a favourite subject of ancient art.

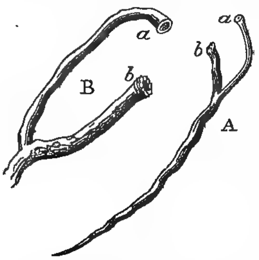
GAOL. See PRISON.

GAOL DELIVERY, COMMISSION OF, is one of the four commissions issued to judges of assize in England, under which they discharge their duties on circuit. See ASSIZE. Commission of gaol delivery empowers the judges to try and deliver every prisoner who shall be in the gaol when they arrive at the circuit town. It is directed to the judges, with whom are coupled the serjeants-at-law and Queen's counsel on the circuit, the clerk of assize, and the associate. It constitutes the persons to whom it is directed the Queen's justices, and orders four, three, or two of them, of whom one must be a judge or serjeant, to proceed to try prisoners. It was anciently the course to issue special writs of gaol delivery for each particular prisoner, which were called the writs *de bono et malo;* but these being found inconvenient and oppressive, a general commission for all the prisoners has long been established in their stead (Stephen, *Comm.* iv. 371). It is not incumbent on the commissioners to deliver all the prisoners in the gaol, but they cannot try any one who was not in custody or on bail at the opening of the commission. A commission of gaol delivery has power to order that the proceedings at any trial shall not be published till all the trials are finished. Violation of this order is contempt of court, and is punishable by fine and imprisonment. At common law, a commission of gaol delivery is suspended by the Court of Queen's Bench sitting in the same county; but by 25 Geo. III. c. 18, the session at Newgate of oyer and terminer and gaol delivery is not to be interrupted by the commencement of term and sitting of the King's Bench at Westminster. By 4 and 5 Will. IV. c. 36, a special court has been created for London and the suburbs, called the Central Criminal Court (q. v.), for which a special commission of gaol delivery is issued.

GAP, a small town of France, capital of the department of Hautes Alpes, is pleasantly situated on the right bank of the Luie, about 50 miles south-east of Grenoble. It is approached through walnut avenues, and surrounded by slopes on which the vine flourishes at the height of 2558 feet above sea-level. When seen from a certain distance, the town has a picturesque appearance; but on a closer inspection, it is found to be merely a labyrinth of dirty, narrow, and ill-paved streets. The chief public building is the cathedral, with a mausoleum in marble of the Constable de Lesdiguières. The town has manufactures of coarse woollens, linens, agricultural implements, and leather. Pop. 5453.

G., the ancient *Vapincum*, was formerly capital of the district of Dauphiné, to which it gave the name of Gapençois. At the commencement of the 17th c., it is said to have had about 16,000 inhabitants. Since that period, however, it has steadily declined in size and importance. It was sacked, and almost wholly reduced to ashes, by Victor Amadeus of Savoy in 1692.

GAPES, a disease of gallinaceous birds, owing to the presence of a *trematode* worm (*Fasciola trachealis*) in the windpipe. This entozoon, allied to the *Fluke* (q. v.), is, however, a creature of very different general form, being a red, wavy, cylindrical worm, tapering at the tail, and forking near the upper extremity, the branch which is sent off terminating in a sucker for adhesion, whilst the mouth terminates the principal trunk. The whole length seldom exceeds an inch. Twenty of these worms, of various sizes, have been found in the windpipe of a single chicken. Pheasants, partridges, &c., are also liable to be infested by them. They produce inflammation, and sometimes suffocation and death. A common remedy is to introduce into the bird's throat the end of a feather, well oiled, and to turn it round, so as to dislodge the worms, which are then either brought out by the feather, or coughed out by the bird. Another cure is to give a little Epsom salts mixed with the food. Urine is often used in the same way, and with similar efficacy.



Fasciola Trachealis:
A, the whole worm; B, the upper extremity, magnified: *a*, the sucker at the end of its branch; *b*, the head, with mouth.

GARANCEUX is a term now applied to the rough preparation which was formerly called garancine—namely, the spent madder acted on by sulphuric acid, as mentioned under GARANCINE.

GA'RANCINE, a manufactured product of madder; hence its name, derived from the French *garance*. The discovery of the process for making this material is due to the French, and it has proved one of the most valuable additions to our dyeing materials that has been made during the present century.

It was first practically used in the dyeing establishment of Messrs Lagier and Thomas at Avignon, where it was introduced with the hope of turning the spent madder to account; but the rude manner in which it was prepared prevented it from becoming generally used for a long time, and our ignorance of the organic chemistry of madder at first hindered its improvement. It was first prepared by drying and pulverising or grinding the spent madder which had been used in the ordinary processes of dyeing madder styles; this was then saturated with sulphuric acid, which was supposed to char the woody tissue, and destroy the *alizurine* and some other organic products of the madder, but to have no effect upon the purpurine, which was consequently available for fresh dyeing processes. Subsequent experience shewed these views to be wrong, and garancine is now prepared from pure ground madder-root which has not previously been used.

For this purpose, the ground madder is mixed with water, and left for a day, and then fresh water is added, and the whole drawn off. By this means, the sugar, and probably the whole of the rubian, another principle of the madder, are dissolved and removed. Sulphuric acid is then added, and the temperature raised to about 90° F. for some hours, after which it is well washed with cold water, strained, pressed, and dried, and afterwards ground. In this state, it has a fine chocolate-brown colour, and looks somewhat like ground coffee. The advantages of garancine over madder are, that it is more easily used, and the colours it gives are brighter and more intense, although not so permanent.

GARAY, JÁNOS, a distinguished Hungarian poet, was born at Szegszárd in 1812. G.'s poetical genius manifested itself from early boyhood; for it was noticed by his teachers, that whenever he had to make a school *pensum* of Latin verses, he would usually bring at the same time an elaborate Magyar version. His *Csatár* (the Warrior) was published in 1834, and from that moment till his death, G. was one of the most assiduous workmen in the field of Hungarian literature, being attached in succession to the editorial staffs of the *Regélöi*, *Rajzolatok*, *Hirnök*, and *Jelenkor*. G.'s dramatic works are—*Csáb*, a tragedy in five acts (1835); *Arbocz*, a tragedy in five acts (1837); *Országh Ilona*, an historical drama in three acts (1837); *Utolsó Magyar Khan*, a tragedy in five acts; *Báthory Erzsebet*, an historical drama in five acts. The first complete edition of G.'s poetical works was published at Pesth in 1843. A collection of tales appeared under the title of *Tollrajzok* in 1845; and the historical legends of Hungary, under the title of *Arpádok*, in 1847. A new series of poetry, under the title *Balatoni Kagylók*, was published in 1848. He died at Pesth, November 5, 1853. His last work was *Szent László*, a long historical poem in 12 cantos (2 vols., Erlau, 1850). A complete edition of his poems was published after his death by Franz Ney (Pesth, 1853); and a select number of them have been translated into German by Kertbeny (Pesth, 1854; 2d edit., Vienna, 1857).

GARB, or **GARBE** (Fr. *gerbe*, Ger. *garbe*), a sheaf of any kind of grain. A garb is frequently used in heraldry. If it is blazoned a garb simply, then wheat is understood; if any other kind of grain is intended, it must be mentioned—e. g., 'a garb of oats.'

GARBLERS, GARBLE (Fr. *garber*, to make clean). To garble signifies to sever and divide the good and sufficient from the bad and insufficient. Garbles signify the dust or soil that is severed. By 1 Rich. III. it was provided that no bow-staves should be sold ungarbled; and by 12 Ed. IV. c. 2, it is enacted that bow-staves be searched and surveyed, and that such as be not good and sufficient be marked. 1 James I. c. 19 was passed to preserve the purity of drugs. By this statute, thirty-two kinds of drugs are specified as garbleable;

and it was declared that all these drugs, &c., were to be garbled and sealed by the garbler before sale, on pain of forfeiture of the same or the value thereof. Power was given to an officer, called the garbler, at all times of the day to enter into any shops, warehouses, or cellars, to view and search for such drugs and spices, and to garble and make clean the same. This statute was repealed by 6 Anne, c. 16; but a similar power to that exercised by the garblers is, by 55 Geo. III. c. 194, now reposed in the Apothecaries' Hall of London.

GARCIA, Manuel, a well-known musical genius, was born at Seville, in Spain, in 1775. After acquiring a considerable reputation as a singer in Cadiz and Madrid, he went to Paris in 1808, where he obtained great success at the Italian Opera; and in 1811 proceeded to Italy, where he was received with equal favour in Turin, Rome, and Naples. From 1816 to 1824, he was constantly engaged as a singer, either in Paris or London. Subsequently, with a select operatic company, composed in part of members of his own family, he crossed the Atlantic, and visited New York and Mexico. On the road between Mexico and Vera Cruz, he was robbed of all his money; and after his return to Paris, he was compelled to open a class for singing, as his voice had become greatly impaired by age and fatigue. Many of G.'s pupils reached a high degree of excellence, but none equalled his eldest daughter Maria, afterwards Madame Malibran (q. v.). He was less successful as a composer, although several of his works, especially *El Poeta Calculista* and *Il Califo di Bagdad*, were much admired. G. died at Paris in June 1832.—Pauline Viardot-Garcia, second daughter of Manuel, was born at Paris in 1821. She has also acquired a great reputation as an operatic singer.

GARCILA'SO, surnamed (by himself) the *Inca*, was born at Cuzco, Peru, in 1540. He was the son of Garcilaso de la Vega, who belonged to the same family as the poet of that name, and who was one of the conquerors of Peru. G.'s father married Elizabeth Palla, a princess of the race of the Incas, and niece of the famous Huayna Capac, the last emperor of Peru, and G., though a Spaniard and a Christian, was exceedingly proud of the royal blood which flowed in his mother's veins. At the age of 20 he proceeded to Spain, and never again visited America. During the greater portion of his life he lived at Cordova, where he died in 1616. His first work was a *History of Florida* (*La Florida del Ynca*. Lisbon, 1605). It contains an account of the conquest of the country by Fernando de Soto. In 1609 appeared the first, and in 1616, shortly before his death, the second part of his work, on the *History of Peru*, entitled *Commentarios Reales que tratan del Origen de los Incas de sus Leyes y Gobierno.* This work is valuable, not so much for any great historical talent which it betokens in the author, as on account of its being almost the only source of information which we possess concerning the ancient Peruvians. G. well understood his mother-tongue, and was thus enabled to correct the errors which other Spanish writers had fallen into from ignorance of the Peruvian language. G.'s *History of Peru* was translated into English by Sir Paul Rycaut (Lond., 1688); and into French (2 vols. Amsterdam, 1727).

GARCILA'SO DE LA VEGA, a Spanish soldier and poet, was born at Toledo, in 1500 or 1503. He early adopted the profession of arms, and gained a distinguished reputation for bravery in the wars carried on by the Emperor Charles V. against the French and Turks, but was mortally wounded while storming a castle near Fréjus, in the south of France, and died at Nice, November 1536, in the thirty-third year of his age. G., though prematurely cut off, lived long enough to win immortality, and though he wrote little, he revolutionised the national poetic taste of his countrymen. For the short metre of the older romances and redondillas, he substituted the hendecasyllabic verse of the Italians. His pieces consist of only 37 sonnets, 5 *canzones*, 2 elegies, 1 epistle, and 3 pastorals. Singular to say, they do not contain a trace of military ardour, but are inspired by a tender sweetness and melancholy which appear to have deeply affected his countrymen. 'His sonnets,' says Ticknor, in his *History of Spanish Literature*, 'were heard everywhere; his eclogues were acted like popular dramas. The greatest geniuses of his nation express for him a reverence they shew to none of his predecessors. Lope de Vega imitates him in every possible way; Cervantes praises him more than he does any other poet, and cites him oftener. And thus G. has come down to us enjoying a general admiration, such as is hardly given to any other Spanish poet, and to none that lived before his time.' The best of the numerous editions of G.'s poems is that by Azara (Madrid, 1765). They have also been translated into English by Wiffen (Lond. 1823).

GARCI'NIA. See Mangosteen.

GARD, a department in the south of France, bounded on the E. by the river Rhone, is triangular in shape, its southern extremity reaching into the Mediterranean in a headland which has a coast-line of about ten miles. It has an area of 2291 square miles, and in 1856 a population of 419,697. One-third of the area is arable, one-third waste land, and the remainder occupied by forests, plantations, vineyards, and, on the coast, by extensive and unhealthy marshes. It is watered mainly by the Rhone, and by its tributaries, the Gard—from which the department has its name—and the Ceze. Of its surface, the north-west is occupied by a branch of the Cevennes; the remainder slopes toward the Rhone and the Mediterranean. The soil is in general dry, the best land occurring in the river-valleys. Coal is found in several places, and salt-works are extensively carried on in the south. The vine (which yields about 26,400,000 gallons of wine annually), the olive, and the mulberry are the principal products. The chief manufactures are silk, woollen, and cotton goods; hats, ribbons, gloves, &c. Wine is largely exported. The department is divided into the four arrondissements of Nîmes, Alais, Uzes, and Le Vigan; the chief town is Nîmes.

GARDA, Lago di, one of the most remarkable of the Alpine lakes, and the largest in Italy, was the Lacus Benacus of the Romans. Its modern name is derived from the small village of Garda, situated on its eastern shore, and containing 3000 inhabitants. G.'s chief tributary is the river Sarca, which rises from the glacier of Monte Adamo, but it also receives several smaller streams descending from the valleys of Ledro, Tavalo, and Vesta. The northern extremity of the lake enters the territory of Trent in the Italian Tyrol. On the E. it has the province of Verona; on the W., that of Brescia; very variable; the average generally exceeds 120 and on the S., that of Mantua. Its greatest length, from Riva to Peschiera, is 32 miles; and its breadth, from Desenzano to Garda, 10 miles. Its depth is feet; in the direction of Mallesine, it reaches 700 and 800 feet; and its maximum, as yet ascertained, is 1900 English feet. The principal islands are Trimelone, Olivé, and St Pietro. The scenery is grand. Alpine spurs border the lake on both sides, and descend steeply to its shores, but contain within themselves also many beautiful and fertile valleys. The waters of this lake are remarkably clear, and abound in fish of various kinds. Owing to the extent of its surface, and the violent winds to which it is exposed, waves often rise on it to a considerable height, giving its waters the appearance of a rough sea. The only outlet is the river Mincio at Peschiera, which descends to Mantua, and discharges itself into the Po. The mild climate in the district of the lake, and the beauty of its vicinity, have caused its shores to be lined with beautiful villas. Especially attractive to the scholar is the neck of land called *Sermione* (the *Sirmio* of Catullus), where the remains of that poet's country-house are still traceable. Since the peace of Villafranca, Lake G. forms the barrier which separates Venetia from the kingdom of Italy.

GARDAI'A, or **GHARDEIA**, an important trading town of Algeria, in the Sahara, chief town, and seat of the Djemmâa or elective council of the Republic of the Seven Cities of the Mzab district, is situated amid savagely naked and rocky mountains, in lat. 32° 28′ N. and long. 4° 38′ E., 312 miles in direct line south-south-east of Algiers. It is fortified by an enclosing wall, surmounted by nine towers, and pierced by ten gates; contains six mosques, one remarkable for its size; and has a flourishing trade by means of caravans with Tunis, Algiers, Fez, Marocco, Sûdan, and Timbuctu, in slaves, dates, barley, pottery, provisions, oil, wool, cotton, indigo, leather, gold-dust, ivory, and all the varied raw produce of Central and Northern Africa. G. is surrounded by extensive orchards, irrigated from wells, some of which are 900 feet deep. In the vicinity are the ruins of a tower, supposed to have belonged to the Romans. The Mzab republic or confederacy pays to the French an annual tribute of 30,000 francs, 14,000 francs of which are contributed by G. alone. In return for this, the French secure them from all wars and marauders, and open to them freely the markets of the Tell, or coast regions of Algeria. Pop. 13,000. See the *Great Sahara, Wanderings South of the Atlas Mountains*, by H. B. Tristram (London, 1860).

GARDANT, in Heraldry, is said of an animal which is represented full-faced, and looking forward. See PASSANT-GARDANT.

GARDE NATIONALE, the celebrated burgher defenders of order in Paris and certain other French towns, was for the first time introduced into Paris during the Revolution of 1789. It had existed for a long time previous in some of the French towns, having been at first employed to defend the rights and privileges of the city, and subsequently to guard the persons and property of the citizens. When, in July 1789, the entire lower orders of the capital rose and demanded arms, the leaders of the Revolution, sitting at the Hôtel de Ville, seized the opportunity to decree, without consulting the government, the formation of a national guard for Paris of 48,000 citizens, which, in the first instance, they named the Parisian Militia. Each electoral district was to enrol a battalion of 800 men, divided into four companies of 200 men each, 15 of these companies forming a legion. The officers of the battalions were to be elected by the privates; but the higher officers were named by the Committee. The device chosen as the badge of the service was of blue and red, the colours of the city, to which white, the colour of the army, was added, to denote the intimate union which should subsist between the defenders of national liberty and the military. Thus arose the celebrated tricolor, afterwards adopted as the national badge, and now borne in honour wherever the French name extends. On the king consenting to the removal of the regular troops from Paris, Lafayette (q. v.) was named Commandant of the National Guard of the city. Ere many more days had elapsed, the friends of municipal freedom had organised themselves into burgher troops in every important town, and the National Guard had become a recognised institution of the whole kingdom, the entire number raised being not under 300,000. The force soon acquired an extraordinary degree of discipline and efficiency—in a great degree from the number of old soldiers who, having deserted the crown, were elected to commissions by the municipal troops.

Throughout 1789, the National Guard looked on supinely at the excesses of the democratic party in the provinces, and joined the mob in Paris during the atrocities of the 5th October; but, under Lafayette, better counsels prevailed, and the national army restored order, rescuing the royal family on the 11th of October. For some months after this time, the National Guard firmly withstood the more violent insurrectionists, who would have deluged the capital with blood; but irresolution and indecision marked their actions in August 1792, and they stood tamely by during the appalling massacres in the prisons. As the Revolution held its sanguinary course, the National Guard receded more and more from the moderate views which it had at first supported, until, in 1794, we find it among the most devoted adherents of Robespierre and his bloody triumvirate, ever ready to lend its aid in the execution of their merciless decrees. Later in the year, however, when the Reign of Terror stood balanced between power and death, the National Guard proved, under the command of Barras, faithful to the Convention, which had deposed Robespierre and his terrible colleagues. In 1795, the National Guard aided in the disarmament of the populace; the reign of the multitude ceased, and the force itself was thoroughly re-organised, all elements of internal turbulence being carefully excluded from its ranks. Under this constitution, none were eligible to serve as National Guards but citizens of substance, labourers and the lowest classes being deemed dangerous. Not many months after, so great was the reaction, that the corps had become quite royalist in its feelings, carrying their sympathies at length to open rebellion against the Convention; but they sustained an utter defeat from a small body of troops of the regular army, who, under Barras and Napoleon Bonaparte, defended the Convention. After this reverse, the National Guard ceased practically to exist. It is worthy of remark, however, that in 1794 the latter general had been offered the command of the National Guard by Robespierre, and had declined it: had he accepted, how different might have been the fate of Europe.

In 1805, on the eve of the great continental campaign, which he expected would denude France of its regular troops, Napoleon re-instituted the G. N., taking care, however, that no elective or democratic principles should pervade the body. By a decree of September 23, in which the whole empire was included, every man in good health was required to serve, between the ages of 21 and 60: the officers were to be named by the Emperor. The companies were localised among the villages and townships; ten companies formed a cohort, and several cohorts, according to the district, formed a legion. This force was maintained in succeeding years in discipline and efficiency; and in 1812, before the great Russian campaign, the Emperor placed a large portion of the National Guard on permanent duty. He reaped the advantages of this step when, in 1813, after the disastrous issue of that year's warfare, he found 100,000 well-drilled steady troops ready to replace his lost veterans, and fill some of the vacancies in the ranks. In 1814—when advancing to meet the allies, he parted from his empress and his son, the little king of Rome, for the last time—Napoleon solemnly committed them to the protection of the National Guard of Paris. After the Bourbon restoration, the National Guard continued an important body in the state until 1827, when, its attitude becoming insubordinate, Charles X. dissolved it, but neglected to *disarm* the members. Enraged at this slight, these men were among his most formidable opponents at the revolution of 1830. Under Louis Philippe, in that year, the G. N. was re-established throughout France, Lafayette being appointed to the command-in-chief, a post, however, from which he was removed shortly afterwards, as his power became dangerously great. In 1831, the National Guard of Lyon was implicated in the insurrection there; and in the following year, a considerable portion of the urban legions of Paris took part in the sanguinary disturbances of the Quartier St Meri, in which, however, they were overcome by the firmness and fidelity of the suburban legions of the *banlieu*. Feeling its power over the Citizen King of its own creation, the National Guard verged more and more towards republican principles, until, in the critical moments of the reform insurrection of 1848, the guard of the capital deserted from Louis Philippe to the revolutionists, and so put an end to the Orleans dynasty. In the troubles of the spring and summer of 1848, the G. N.—a few legions, subsequently dissolved, excepted—steadfastly supported order, and opposed the Socialists. On the election of Louis Napoleon to the presidency, he found it necessary to dissolve the Guards in 153 communes; and he re-organised the remainder on a footing to insure the absence of Socialistic views.

By an ordinance of June 1851, the National Guard was placed nearly on the footing of Louis Philippe's reign; but by a subsequent decree of 1852, which still holds, the entire force was dissolved, and reformed on a more military basis, in certain departments only. Now, all officers are named by the emperor, by whom alone the formation of special corps can be sanctioned. In revolutionary times, a national guard has been established in other countries also, and still continues to exist in Belgium and Italy. In the southern portion of the latter kingdom, the services of the national guard are at present (1862) in frequent requisition in the cause of order.

GA'RDELÈGEN, a small town of Prussian Saxony, is situated about 30 miles north-north-west of Magdeburg, on the Milde. It has manufactures of leather, several mills and distilleries, and five annual fairs. Pop. 5402. G. is very old. Tradition says that in ancient times it was called Isenburg (*Castrum Isidis*), from being a sanctuary of the goddess Isis, and that it was destroyed by the Franks. Be this as it may, it was certainly destroyed by a Duke Dervan in 633 A. D., and rebuilt about 924. Subsequently, for a long period, it was the seat of princely markgrafs, who were called Counts of Gardelegen. Until 1478, it remained a free town.

GARDE'NIA, a genus of trees and shrubs, of the natural order *Cinchonaceæ*, natives of tropical and sub-tropical countries, many of which are now favourites in our green-houses and hothouses, on account of their beautiful and fragrant flowers. Some of them are hardy enough to endure the open air in summer. The corolla is funnel-shaped, or approaching to salver-shaped, the tube much longer than the calyx; the fruit is a berry crowned with the calyx. *G. florida* and *G. radicans* are among the species best known in Britain, and bear the name of Cape Jasmine, but are natives of Japan. The fruit of the former, which is about the size of a pigeon's egg and orange-coloured, is sold in the shops of China and Japan for dyeing silks yellow. A beautiful yellow resin exudes from wounds in the bark of *G. arborea* and *G. gummifera*, Indian species. The wood of *G. Thunbergii* and *G. Rothmannia* is very hard, and is used for agricultural implements, wheel axles, &c., at the Cape of Good Hope. Both of these species are known in Britain as esteemed hothouse plants.

GARDENING, or HORTICULTURE, differs from agriculture in the comparatively small extent of ground used, the much greater variety of productions sought from it, and, consequently, also to no small extent in the manner of cultivation. The different ordinary productions of the garden are usually classed under the three heads of *Flowers*, *Fruits*, and *Culinary Vegetables*, concerning which see FLOWER-GARDEN, FRUITS, and KITCHEN-GARDEN. In large gardens, these departments are kept very distinct, particularly the first and last of them; but in small gardens they are generally more or less combined.

Where circumstances permit a choice of situation, a garden ought to be as fully as possible exposed to the rays of the sun, and in the northern parts of the world a gentle slope to the south, south-east, or south-west is even preferable to a perfect level. But a slope in the opposite directions is by all means to be avoided. The form of a garden, unless where some peculiarity of situation determines it otherwise, is usually a parallelogram; and it is considered desirable, at least in the case of a walled garden, that it should be longer from east to west than from north to south, in order to have as much as possible of the best exposure of wall for fruit-trees. This is also sometimes increased by the enclosure within a fence of some other kind, of a piece of ground called a *slip*, exterior to the wall. A wall, either of brick or stone, is the best enclosure for a garden; brick being preferable on account of its more perfect adaptation to fruit-trees (see WALL-TREES); but where this is deemed too expensive, hedges of thorn, holly, &c., are resorted to. Hedges afford good shelter from winds, but have the disadvantages of harbouring birds and snails to an inconvenient degree, and of withdrawing to their own support much of the strength of the adjacent soil. The garden, if in the form of a parallelogram, is usually divided into smaller parallelograms; a large garden, in the first instance, by cross-walls, smaller gardens at once by *walks*, and the *plots* thus formed are, if necessary, broken up by paths into smaller plots or *beds* for different kinds of plants. The paths within the plots are made by mere treading with the foot, when the ground has been newly dug, and are intended only for a single season; the walks are permanent, and are carefully made, usually by throwing out the earth to the depth of at least a few inches, and supplying its place with stones, cinders, broken bricks, slag from furnaces, or the like—whatever, in fact, is least likely to afford nutriment to plants—the surface being covered with gravel, which is kept clear of weeds by frequent stirring with the hoe or Dutch hoe. The walks are seldom less than five feet in width. The ground occupied by them is still useful for the nourishment of plants, and particularly of trees or shrubs, growing near them. They have generally Edgings (q. v.) to separate them neatly from the adjoining cultivated ground; and in damp situations, it is thought desirable to have them as much elevated in the centre as is consistent with comfort in walking on them.

The soil of a garden is often prepared with a degree of care which is impossible in regard to a farm. A deep, rich, and easily penetrable soil is desirable; and where the immediate expense is not much regarded, the soil of a garden is sometimes almost entirely artificial; more generally, means are used for ameliorating the original soil. Of these means, one of the most important is *trenching*, by which the soil is deepened, and it is desirable that the soil of a garden should be at least three feet deep. The proper depth of trenching, however, depends on the original depth of the soil and the nature of the subsoil; where the soil is pretty uniform to a considerable depth, the deepest trenching is advantageous; and the available soil may often be deepened by incorporating a portion of the subsoil with it, but if too much of a subsoil unsuited for vegetation is at once thrown up by trenching, it may communicate its own barrenness for years to the soil, ere it is mellowed by exposure to the air, manures, and the processes of cultivation. A stiff clay soil is very unsuitable for many of the crops required in a garden, and ought to be mixed with as much sand and vegetable matters as can easily be procured, both at the formation of the garden and afterwards. It is of course necessary, in all cases, that a garden be thoroughly drained; it is also of great consequence to have the means of irrigation, or at least of abundant watering, which, even where the climate is generally moist, greatly tends to increase the produce in dry seasons, and is almost always necessary to the perfection of certain crops. Indeed, if water can be obtained to form a small pond, or to pass through the garden as a rivulet, it may not only be turned to account for purposes of ornament, but also of utility, in the cultivation of many plants which cannot be successfully cultivated otherwise. This use of water is far from being so common as it might be in British gardens; even a cranberry-plot, although a pleasant thing and of easy attainment, being seldom thought of; the Chinese are better acquainted with it, and cultivate aquatic plants to an extent that has never been equalled amongst any other people.

A liberal supply of manure is necessary for a garden; the kinds of manure must be accommodated to the soil and to the different plants, and must often also depend in part on other circumstances. Care must be taken not to overdose with guano, or indeed with strong manure of any kind, by which plants might be killed rather than nourished. Farm-yard or stable-yard manure ought in general to be subjected to a process of decomposition in heaps before being used; and great advantage is derived from mixing it with other substances to form Composts (q. v.). Nor ought any of the weeds and other refuse vegetable produce of the garden to be thrown away or dissipated in smoke, but all should be gathered into some corner appropriated to the purpose, there to decompose and form a heap of vegetable mould, which is for many purposes one of the best manures that can be used. Peat is, in some soils and for some plants, a very useful manure or ingredient in the formation of composts.

A garden ought to be *delved* or dug with the spade in the end of autumn, except where the presence of a crop prevents, the ground being left very rough, to expose the soil as much as possible to the influences of the weather. When the crops are planted in spring, a very slight stirring of the surface is all that is required. The usefulness of a garden, however, is much increased by making a considerable part of it produce crops even during winter. Greens of various kinds are commonly obtained from the garden during winter, even in the northern parts of Britain; the variety of winter crops in the southern parts is greater; but nowhere is a system of constant cropping so thoroughly maintained as in the market-gardens around London. Of course, constant cropping requires frequent and abundant manuring; and care is taken that each crop is succeeded by one of a completely different kind, a rule which is indeed always, as far as possible, to be observed both in horticulture and agriculture.

In laying out large gardens, fruit-trees trained on espaliers are not unfrequently planted around the borders of plots; in smaller gardens, gooseberry and currant bushes generally occupy this situation, often in addition to a plot entirely devoted to these bushes. Fruit-trees are often also planted as standards in the plots devoted to culinary vegetables. The productiveness of a garden may certainly thus be increased, as ground duly manured will yield a greater return of different kinds of produce than of one kind, whilst the owner has the additional pleasure of the greater variety; but it is to be remembered that the roots of trees and bushes spread a long way through the soil, and render it less suitable for many crops.

The implements most necessary in gardening are the spade, fork, rake, hoe, Dutch hoe, garden-line, wheelbarrow, pruning-knife, and watering-can.

The practice of gardening, of course, varies much in different countries, on account of the difference of climate, although some of its rules are of universal application. Of the history of gardening, little needs to be said. We know little of the gardening of the most ancient nations, except that it was practised, both for the sake of the produce and for pleasure, in all the seats of civilisation; and that the Greeks borrowed their methods of gardening from the Persians, the Romans in their turn copying from the Greeks. Of the gardening of the Romans, some account has been transmitted to us, from which we know that they had attained to no small proficiency in it. During the middle ages, gardening continued to be sedulously prosecuted in all the more civilised parts of Europe; Charlemagne enacted laws which contributed much to its promotion; and even in comparatively barbarous regions it was carried to great perfection by the monks, traces of whose skill and diligence are still to be seen in the vicinity of many a ruined monastery. The practice long prevailed of forming gardens, if situated on a slope, into terraces, and many a fine example of this kind of garden still remains at old country-seats. In a few places, also, may be seen remaining specimens of the clipped hedges and fantastically clipped trees and bushes, which, until last century, seem to have been thought the chief ornaments of a garden; other puerile conceits being often associated with them, some of which are not yet entirely exploded, although a green bush in its natural form is universally regarded as more beautiful than one made to grow into the shape of a vase or of a peacock. But the history of taste in gardening accords with the history of taste in laying out parks and pleasure-grounds, concerning which, see Landscape-gardening.

The market-gardening of the neighbourhood of London is on a scale proportionate to the greatness and wealth of the city; large fields, instead of little plots, are devoted to one kind of crop, and as an illustration it may be mentioned, that from one garden alone 200,000 gherkins (young cucumbers for pickling) have been sent to market in a single day. At Mitcham, near London, and at a few other places in England, medicinal plants are largely cultivated.

Nurseries are gardens devoted to the raising of young plants, both trees and some kinds of culinary herbs, and of garden-seeds.

The cultivation of the more important garden-plants is noticed under their several heads. See also GRAFTING, GREEN-HOUSE, HOTHOUSE, HOTBED, STOVE, &c.

GARDES SUISSES, a celebrated corps in the French army, constituted 'Gardes' by royal decree in 1616. They comprised upwards of 2000 men, were always unswerving in their fidelity to the Bourbon kings, and are chiefly remarkable for their heroic end. On the 10th August 1792, they withstood the Parisian revolutionary mob, and defended the palace of the Louvre till almost every man was cut down. During the resistance they offered, the royal family was enabled to escape to such shelter as the National Assembly afforded.

GARDE-VISURE, the heraldic term used for what is commonly called the visor, or front part of the helmet, used for the defence of the face and eyes.

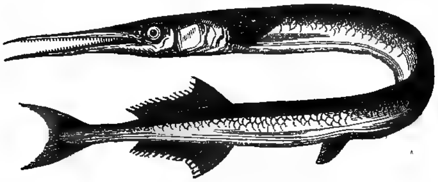
GA'RDINER, a city of the United States, North America, is situated in the south-west of the state of Maine, on the right bank of the Kennebec, seven miles below Augusta. It has numerous saw, paper, and other mills; has tanneries, machine-shops, a foundry, a woollen factory, and a pottery. G. is at the head of the ship-navigation of the Kennebec, and 6000 tons of shipping are owned here. Pop. (1850) 6486, but since the recent incorporation of part of the territory of G. with other townships, its population has decreased.

GARDINER, STEPHEN, a celebrated English prelate and statesman, the illegitimate son of Dr Lionel Woodville, Bishop of Salisbury, brother of Elizabeth Grey, queen of Edward IV., was born at Bury St Edmunds, Suffolk, in 1483. He studied at Trinity Hall, Cambridge, and in 1520 became master of his Hall. Soon after, through the patronage of the Duke of Norfolk, he was introduced to Cardinal Wolsey, who made him his secretary. In this capacity he acquired the confidence and favour of Henry VIII., and from his knowledge of the civil and canon law, was sent to Rome in 1527, to conduct the negotiation with the pope for the king's divorce from Catharine of Aragon. He was then usually called Dr Stephens. His exertions were unsuccessful; but having rendered services at the papal court to the Bishop of Norwich, he was by him afterwards appointed Archdeacon of Norfolk, while he promoted Wolsey's interests as a candidate for the pontificate. On his return, he was made secretary of state, and in the spring of 1531 was advanced to the archdeaconry of Leicester. In November of the same year, he was installed Bishop of Winchester. Notwithstanding his allegiance to the pope, he warmly supported the king's supremacy, and wrote a treatise in defence of it, entitled *De Vera Obedientia*. He was sent on embassies to France and Germany, and invariably opposed all measures tending to a religious reformation in England. He had a principal hand in the downfall and execution of Thomas Cromwell, in 1540, and he drew up an impeachment of heresy against Henry's last queen, Catharine Parr; but in a personal interview with Henry she re-established herself in the king's favour, and G. fell into disgrace. At the accession of Edward VI., January 28, 1547, for refusing to comply with the Reformed doctrines, he was committed to the Fleet prison, but released in the following December. In 1548, he was again seized, and committed to the Tower, and on his refusal to sign certain articles submitted to him, was deprived of his bishopric. When Mary ascended the throne in 1553, he was set at liberty, restored to his see, and appointed lord chancellor and first minister of state. He took the lead in all the bitter persecutions of the Protestants during Mary's reign, and is charged with great caprice and extreme cruelty; but Dr Maitland shews that many of the statements regarding G. are gross misrepresentations, and that in very many instances the parties brought before his court were arraigned for treason or sedition, rather than for heresy; and Roger Ascham freely confesses that G. interposed to protect him when summoned by the council on a charge of heterodoxy. The management of the queen's marriage with Philip of Spain was intrusted to him, and he officiated at their nuptials. He died November 12, 1555. A treatise, entitled *Necessary Doctrine of a Christian Man*, printed in 1543, is said to have been the joint production of G. and Cranmer. G.'s character has been the subject of much criticism; but it can scarcely be doubted that he was a zealous, though not a spiritually minded, ecclesiastic. His devotion was that of an out-and-out *partisan;* but it was nevertheless real, after its fashion, for G. would have given his life to advance the cause which had commanded his sympathies and his support.

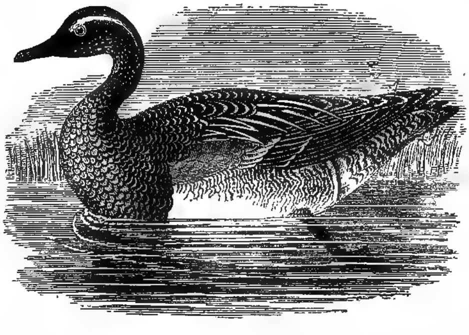
GARDINER, COLONEL JAMES, son of Captain Patrick Gardiner, was born at Carriden, in Linlithgowshire, January 11, 1688, and when only 14 years old, obtained a commission in a Scots regiment in the Dutch service. He afterwards entered the English army, and was severely wounded at the battle of Ramilies in 1706. G. fought with great distinction in all the other battles of Marlborough. In 1714—1715, he was made captain-lieutenant in a regiment of dragoons. Some time after, he gave a conspicuous proof of his courage, when, along with eleven other daring fellows (eight of whom were killed), he fired the barricades of the Highlanders at Preston. From an early period, G. was noted for his licentiousness, which was so marked, that ordinary officers, making no pretensions to religion, rather shunned his society, for fear of being corrupted; yet his constitution enabled him to pursue his vicious courses with apparent impunity, and in consequence of his continual gaiety and good health, he was known as 'the happy rake.' But in the year 1719, he suddenly became the subject of profound religious impressions. The circumstances, as narrated by Dr Doddridge (who had them from the hero himself), contain much that is marvellous, supernatural, and exceedingly improbable. Doddridge himself is hardly satisfied with G.'s account, and hints at the possibility of the whole being a dream, instead of a 'visible representation of the Lord Jesus Christ upon the cross, surrounded on all sides with a glory,' &c. He also mentions that G. 'did not seem very confident' whether the voice which came to him was really 'an audible voice, or only a strong impression on his mind equally striking.' Considerable doubt has recently been cast on the whole story by the publication of the *Autobiography of Dr Alexander Carlyle*, edited by John Hill Burton (Edin. Blackwood and Sons, 1860), in which Carlyle denies altogether the truth of Doddridge's version of the story, at least of the supernatural portion of it. The attendant circumstances, however, are of little moment one way or another; the great fact is the conversion of the brave but wicked soldier into a pious and excellent Christian, and regarding this there has never been any doubt. In 1724, G. was raised to the rank of major, and in 1726 he married Lady Francis Erskine, daughter of the fourth Earl of Buchan, by whom he had 13 children, only five of whom survived him. In 1730, he became lieutenant-colonel of dragoons, and in 1743 colonel of a new regiment of dragoons. He was killed at the battle of Prestonpans, September 21, 1745; and the spot on which he fell is marked by a monument. The *Life of Colonel Gardiner*, written by Dr Doddridge, is a favourite volume with the more religious portion of the public.

GARE'SSIO, a town in the north of Italy, in the province of Mondovi, and 17 miles south-east of the town of that name, stands on the left bank of the river Tanaro. Tradition assigns to G. an antiquity which seems confirmed by the numerous Latin inscriptions and remains found in its neighbourhood; but owing to the many wars by which it has been devastated, its authentic archives have been entirely lost. Many varieties of marble are quarried here, especially the species known as Persigliano. Pop. 6200.

GAR-FISH (*Belone*), a genus of fishes of the family *Scomberesocidæ*, having the body greatly elongated and covered with minute scales. They are remarkable for the green colour of their bones. The flesh is wholesome, and is often used as food. One species only, the COMMON G. (*B. vulgaris*), occurs in the British seas. It is sometimes called Greenbone, Gorebill, and Mackerel-guide, receiving the last name because it visits the coasts just before the mackerel, coming, in fact, from the deep to the more shallow water for the same reason, to deposit its spawn. It is usually about two feet in length; the tail is forked; the pectoral and ventral fins are small; the upper part of the head and back is of a dark greenish-blue; the cheeks and gill covers, the sides and the belly, are silvery white, the dorsal fin and tail are greenish-brown, the other fins white. The G. is a very lively fish; it swims near the surface of the water, and not unfrequently springs out of it. It is brought to the London market in considerable quantities. The flesh has a flavour somewhat like that of mackerel. Some of the species of G., in other parts of the world, attain a much larger size. Other species are fresh-water fishes of warm climates, as India and Guiana.



Garfish (*Belone vulgaris*).



Garganey, or Summer Teal (*Anas querquedula*).

GA'RGANEY (*Anas querquedula* or *Querquedula circia*), a species of duck or teal, considerably larger than the common teal, although not so large as the wild duck, nor even as the widgeon; a rare British bird, more common in the south of Europe, found also in the north of Africa, and in Asia, at least as far to the east as Calcutta. The male G. is a beautiful bird; the prevailing colour dark brown, finely varied on the cheeks and neck, with short hair-like lines of white; the speculum grayish-green, margined with white; a conspicuous white streak over each eye, extending to the neck. The female is smaller than the male, the colours more dull, and the white streak obscure. The G. is very much esteemed for the table.

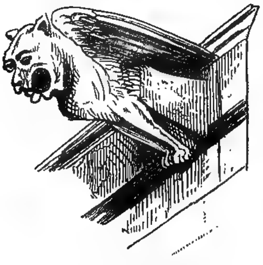
GARGA'NO (anc. *Garganus*), a group of mountains in the province of Capitanata, Naples, forming a peninsula, which stretches eastward for about 20 miles into the Adriatic Sea. The group is composed of three chains of mountains, one of which turns to the north-east, the other to the south, and the third to the west. Its greatest length is 48 miles, and its extreme breadth 24, the circumference being about 120 miles. The southern chain is bleak, sterile, and rocky, broken up into deep valleys, gorges, and ravines. The northern side, on the contrary, is entirely covered with woods, pastures, olives, pines, orange and lemon trees; and the valleys on this side are lovely and fertile, especially those of Rodi, Ischitella, Vico, and Stignano. Owing to the great abundance of aromatic plants which grow among the rocks of the mountains, G. is still as famous for its honey as in the time of Horace, who sings its praise. Monte St Angelo, one of the Gargano chain, is famous for the sanctuary dedicated to St Michael in the year 492, in consequence of a legendary appearance of the saint to St Lorenzo, Archbishop of Sipontum. An annual festival of St Michael is celebrated at this shrine, when crowds of pilgrims flock to the mountain, and increase greatly its picturesque effect by their gay and varied costumes. Mount G. possesses extensive alabaster quarries, which as yet have never been efficiently worked.

GA'RGARA, or **GARGARUS**. See IDA.

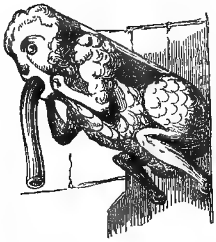
GA'RGLE, or **GA'RGARISM**, a class of medicines intended to be churned about in the mouth and throat, with a view of cleansing the parts when affected with discharges from ulcers; or of acting as Astringents (q. v.) or Stimulants (q. v.), in relaxed sore throat. The best gargles are composed of vinegar or hydrochloric acid largely diluted; of chlorine water or Condy's disinfecting liquor in putrescent cases; of port-wine, alum, and capsicum (cayenne pepper), when a stimulating effect is required; of tannin or oak-bark decoction with alum or borax, in case a pure astringent is needed. Gargles are very useful in the later stages of sore throat, in almost all its varieties.

GA'RGOYLE, a projecting spout, leading the water from the roof-gutters of buildings. Gargoyles of various forms have been used in almost all styles of architecture, but were peculiarly developed in connection with Gothic architecture. In some of the larger medieval buildings, where the height of the walls is considerable, the gargoyles have to project very far, in order to fulfil their duty of throwing the rain off the walls, and are in such cases of a large size. The gargoyles of French buildings have usually great prominence, much more than in England. Some gargoyles are small and plain, others large and ornamental, according to their various positions. They are carved into all conceivable forms—angelic, human, and of the lower orders; and as in fountains, the water is generally spouted through the mouth. In late castellated buildings, they frequently assume the form of small cannons projecting from the parapet. In modern times, the use of leaden pipes to convey away the water from roofs has almost entirely superseded the use of gargoyles.

GARGOYLES.



St Stephen's, Vienna.



St Alkmunds Church, Derby; circa 1450.

Horsley Church, Derbyshire; circa 1450.

GARIBALDI, GIUSEPPE, was born at Nice, 22d July 1807, of respectable parents. His father, the owner of a trading vessel, having been engaged all his life in maritime pursuits, young G. soon acquired a strong predilection for the hazards of a seafaring life. With the permission of his father, he adopted the profession of a sailor, and made his first voyage to Odessa under the command of an able and experienced seaman, Captain Pesante. He subsequently visited Rome, Cagliari, Vado, Genoa, &c., with various commanders, and soon became a skilful and fearless mariner, distinguished by his prompt decision in action and imperturbable presence of mind. In 1830, he was himself in command of the brig *Notre Dame de Grâce;* and about this time his sentiments of patriotism seem to have gained increased intensity, owing to his intercourse with a fervid Italian patriot, a casual passenger on board his vessel. From 1833, his acquaintance with Mazzini and the leaders of the Italian liberal movement dates, and from that period his unquenchable hatred of despotism, and devotion to the service of universal freedom, exercised a predominant influence on all his actions, and ultimately became the *single* motive of his career. In 1834, having compromised himself by participating in a futile revolutionary outbreak at Genoa, he was compelled to save his life by flight; and after extreme hardship, succeeded in gaining French territory simultaneously with the publication in Italy of the sentence of his condemnation to death. G. now resumed his seafaring life, and after some unimportant voyages, sailed for South America. When Rosas, the dictator of Buenos Ayres, declared war against the republic of Uruguay, G. offered his services to the latter, and soon gave proof of so remarkable a talent for military leadership, that he was raised to the supreme command both of naval and military operations. In 1848, war having broken out between Austria and the liberals of Italy, G. hastened to Europe. He bore an effective part in the whole of the Italian campaign, but especially distinguished himself at Rome by his resistance to the French forces, who during four weeks were successfully kept at bay, and repeatedly repulsed by the republican forces of Rome, under the direction of Garibaldi. Rome having at length succumbed to the immensely superior forces at the disposal of General Oudinot, G. marched forth from the city as the French poured in. After a retreat of unparalleled difficulty through districts densely occupied by Austrian forces, G., accompanied by his devoted and heroic Brazilian wife, set sail in a small fishing-craft towards Venice; but being pursued by Austrian vessels, they were compelled to land at random, and not far from the shore his wife, exhausted by the dangers and terrible exertions of their flight, expired in the arms of her husband. G. at length reached Genoa in safety, and from thence embarked for Tunis. He afterwards revisited South America, and acquired the command of an American trading-vessel. In that capacity, he touched at several English ports, where he was received with every testimony of public admiration and sympathy. During the interval which elapsed between the war of 1848 and that of 1859, G. publicly accepted the substitution of monarchy, such as it existed in Piedmont, for the republican form of government, for which he had originally combated, and was therefore free to serve as an irregular auxiliary of the Piedmontese forces on the commencement of hostilities. His services in that capacity were both brilliant and effective, notwithstanding the limited scope assigned for his operations. In the course of the following year (1860), the most triumphant and momentous enterprise of his marvellous career was accomplished. The chief result of the peace of Villafranca, by which the Italian war of 1859 was brought to an abrupt and unsatisfactory termination, was the immediate resumption by the Italian people of the revolutionary and progressive responsibilities, which during the campaign had been vested by the nation in the government of Sardinia. Thus, early in 1860, insurrectionary disturbances broke out in Palermo, and although speedily quelled in the city by the great numerical strength of the Neapolitan garrison, they were constantly repeated throughout the interior of the island, where the insurgents were full of elation and daring, in consequence of G. having transmitted to them the assurance that he would speedily appear himself to head their struggle. In fulfilment of this promise, G. assembled at Genoa a volunteer force of 1070 patriots, and on the 5th of May set sail for the island of Sicily. On the 11th, his two small transport steamers having reached Marsala in safety, the landing of his followers was successfully effected in sight, and partially under fire, of the Neapolitan fleet. On the 15th, in the battle of Calatafimi, 3600 Neapolitan troops were routed by G.'s small force, and to this opening victory may be largely attributed the subsequent success of the entire expedition. It at once cleared the way to Palermo, and inspired G.'s soldiers with irresistible confidence. On the 18th of the same month, G. and his little army of heroes occupied the heights which command Palermo, and after a desperate conflict with the royalist troops, fought his way into that unhappy city, which for several subsequent days had to sustain a ruthless bombardment from the united fire of the Neapolitan garrison and fleet.

The intervention of the British fleet, seconded by the isolated and destitute condition of the garrison shut up in the forts, induced the Neapolitan general to capitulate; and on his departure with his troops, G. remained in undisputed possession of the city and strongholds of Palermo. His first public enactment was the universal armament of the citizens. On the 20th of July, at the head of 2500 men, he gave battle at Melazzo to 7000 Neapolitans, who were completely defeated, and compelled to evacuate the fortress. On the 25th, the Neapolitans were driven back into Messina, where G. made his triumphal entry on the 27th, the mutinous garrison, terrified at his approach, having compelled their general to submit. Towards the middle of August, G. made a descent in Calabria, and was immediately joined by large bodies of volunteers from all directions, by whom he was accompanied on his memorable and eventful march to Naples. On the 5th of September, G.'s army, which then amounted to 25,000 or 30,000 men, occupied Salerno on the withdrawal of the royalists, and on the 7th, amidst the frenzied enthusiasm of the inhabitants, G. entered Naples, with only one or two friends, to prove to Europe that his advent was that of a welcome liberator, and not of a terror-inspiring conqueror. On the previous day, the capital had sullenly witnessed the withdrawal of King Francis II. to the fortress of Gaeta. Before the close of the month, G. had enacted several judicious public reforms, calculated to increase the popularity of the Sardinian government, of which he was the declared representative, although for a brief space he accepted the title and powers of Dictator. On the 1st of October, his military duties became again paramount, as the royalist troops, numbering 15,000 men, came forth from Capua, and attacked fiercely the whole line of the Garibaldians, spread along the Volturno. For some hours a terrible suspense reigned, and more than once it seemed as if success were about to desert the patriots at the last moment; but finally the royalists were driven back to Capua in disorder, and G. announced the result in his famous telegram—'Complete victory along the entire line.' This was G.'s last triumph; Victor Emmanuel, having re-assumed the command of his army, crossed the papal frontier, routed the troops under Lamoricière, and passed on into the kingdom of Naples, where he was met by G., who immediately relinquished into his sovereign's hands the unconditional disposal of the southern volunteer army, and the absolute sway over the Neapolitan provinces. G. absolutely declined all personal distinction or aggrandisement; and having bid farewell to his heroic comrades, he set sail, on the 9th of November, for his home on the rock of Caprera, there to remain in grand simplicity and retirement till his country may again require his aid and invoke his presence.

The almost fabulous success which has tracked this great soldier's enterprises throughout his entire career is the best evidence of his military genius and heroic qualities. In himself, he presents a unique combination of the social and endearing virtues which attract and rivet enthusiastic friendship, and of those stern and commanding attributes which carry terror into the hearts of opponents, and impose subordination and a sense of duty on the most irregular masses of troops. Of a patriarchal simplicity in tastes and habits, he resembles more the chief of a warlike tribe than the general of an army; his smile of approbation ever gladdens the performance of duty by his men, but his reproof of the laggard or craven-hearted is scathingly fierce. G. has come to be regarded as one of the most incorruptible of patriots and most glorious of heroes, either in ancient or modern times; and the land which has produced and nurtured such a spirit and character may be held to have *proved* that it has a political and moral vitality, at least as powerful as any other portion of Christendom.

GA′RIEP, otherwise ORANGE, is a river of South Africa, which, after a westward course of 1000 miles, enters the Atlantic in lat. 28° 30′ S., and long. 16° 30′ E. It rises in the *Mont aux Sources*, near lat. 29° S. and long. 30° E., at an elevation of about 10,000 feet above the sea. Throughout nearly its whole length, it forms the northern boundary of the Cape Colony, separating it below the confluence of the Vaal from still independent tribes, and above that point from the Orange Free State or Orange Sovereignty. For the purposes of navigation, this river is almost useless.

GARIGLIA′NO (the *Liris* of the ancients, which separated Latium from Campania) is the largest and most important river of the Neapolitan provinces. It rises in the Abruzzi, in the valley of Nersa, and discharges itself into the Mediterranean, in the Gulf of Gaeta, after traversing the province of Terra di Lavoro. The sluggish course of its muddy waters (which, however, are stocked with fish, especially eels) has been mentioned by more than one of the ancient poets:

> Non rura quæ Liris quietâ
> Mordet aquâ, taciturnus amnis.—Hor. *Od.* i. 31.

It is asserted that the name G. is derived from an Arabic word, *garil*, which signifies marsh, plain; it was generally adopted in the 11th c., after the defeat of the Saracens, who had held possession for some time of the neighbouring plains, and had erected a castle at the mouth of the river, which they entitled Garilianum. This derivation is appropriate to the marshy swamps surrounding the river, amidst which Marius found concealment when pursued by Sulla. The banks of the G. are memorable for the famous battle fought there between the French, in 1503, and the Spaniards, commanded by Gonsalvo de Cordova, surnamed the Great Captain, in which the former were totally routed.

GA′RLAND. See CROWN.

GARLIC (*Allium sativum*, see ALLIUM), a bulbous-rooted plant, a native of the East, cultivated from the earliest ages. The stem rises to the height of about two feet, unbranched, and bearing at top an umbel of a few whitish flowers, mixed with many small bulbs. The upper part of the stem before flowering is rolled together into a ring. The leaves are grass-like, obscurely keeled, and not fistulous like those of the onion. Three alternate stamens are 3-pointed, the middle point bearing the anther. The bulb consists of about 12—15 ovate-oblong *cloves* or subordinate bulbs, which are axillary buds of its scales thus developed; it contains a viscid juice, which is sometimes used as a cement for porcelain, and has a penetrating and powerful *alliaceous* odour, which indeed pervades the whole plant, with a pungent aromatic taste. It is in general use as a condiment with other articles of food, and to many it is in this way very agreeable;

Common Garlic (*Allium sativum*).

to others, it is disgusting. It is much more largely used in many other countries than in Britain: in Spain, it enters into the composition of almost every dish. Garlic, or its fresh juice, is also used in medicine. It is stimulant, tonic, and promotes digestion; it has also diuretic and sudorific properties, and is a good expectorant, promoting all the excretions. Applied externally, it is a rubefacient, and is used to stimulate indolent tumours. A liniment of oil and garlic juice is sometimes applied to the chest in infantile convulsions. In some cases of deafness, much benefit is obtained from a clove of garlic or a few drops of the juice put into the ear. Garlic is also used as an anthelmintic. It owes its properties chiefly to *oil of garlic* (see following art.). Garlic abounds also in mucilage. The cultivation of garlic is extremely easy; it is generally propagated by its cloves.—Many of the species of *Allium* are popularly called garlic, with some distinctive addition. *A. oleraceum* is sometimes called Wild Garlic in England, and its young and tender leaves are used as a pot-herb. Its leaves are semi-cylindrical, and grooved on the upper side. The stamens are all simple.

GARLIC, Oil of. When cloves of garlic are distilled with water, about 0·2 per cent. of a brown heavy oil, with an acrid taste, and a strong disagreeable smell, passes over. By careful rectification from a salt-water bath, about two-thirds of the oil may be obtained in the form of a yellow liquid, which is lighter than water, and which, when treated with chloride of calcium (in order to dry it), and subsequently distilled from fragments of potassium, comes over pure and colourless as sulphide of allyl, an organic compound of very considerable interest, whose formula is C_6H_5,S. The crude oil also contains oxide of allyl (C_6H_5,O), and a compound of allyl still richer in sulphur than the sulphide.

Sulphide of allyl exists not only in oil of garlic, but also in the oils of onions, leeks, cress, alliaria, radishes, asafœtida, &c. It is a light, clear, pale-yellow oil, with a penetrating odour of garlic; it boils at 284°, and dissolves readily in alcohol and ether.

Sulphide of allyl may be obtained from essential oil of black mustard (which in its purified form is represented by C_6H_5,C_2NS_2, and may consequently be regarded as sulphocyanide of allyl) by distillation with sulphide of potassium. The reaction is exhibited in the following equation:

$$\overbrace{C_6H_5,C_2NS_2}^{\text{Oil of Mustard.}} + \overset{\text{Sulphide of Potassium.}}{KS} = \overbrace{C_6H_5,S}^{\text{Sulphide of Allyl.}} + \overbrace{K,C_2NS_2}^{\text{Sulphocyanide of Potassium.}}$$

We may perform the converse experiment, and obtain oil of mustard from oil of garlic by mixing alcoholic solutions of sulphide of allyl and corrosive sublimate, when a white precipitate is formed, represented by $C_6H_5S,2HgS + C_6H_5Cl,2HgCl$, and distilling this compound with sulphocyanide of potassium, in which case oil of mustard will be found among the products.

The pungency of horse-radish, scurvy-grass, and other allied plants, is due to the presence of this essential oil of mustard or sulphocyanide of allyl.

We shall postpone the further consideration of sulphocyanide of allyl to the article Mustard, Oil of, but shall take this opportunity of very briefly noticing the chief members of the allyl series, which has recently been studied with very fruitful results by several of our most eminent chemists.

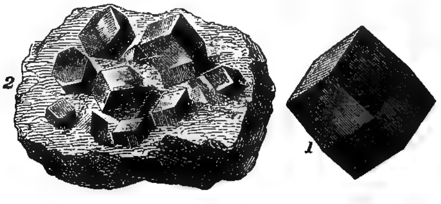
Free allyl (C_6H_5, or, more probably, C_6H_5,C_6H_5) is a very volatile combustible fluid, with a combined odour of ether and radishes. It is obtained by the action of sodium on iodide of allyl.

Allylic alcohol (C_6H_5O,HO) is metameric with acetone and propylic aldehyde, but it differs from them in its properties. It is obtained by the action of ammonia on oxalate of allyl.

Allylic ether or oxide of allyl (C_6H_5O) has been formed in at least two different ways, but the reactions accompanying its formation are too complicated for notice in this article. It exists ready formed in small quantity in oil of garlic, and some other oils that resemble it, and may be obtained by the decomposition of oil of black mustard.

The chloride, bromide, and iodide of allyl have all been obtained. The iodide is a colourless liquid, of specific gravity 1·789, with an ethereal, and somewhat alliaceous odour. It is decomposed by digestion with a watery solution of ammonia, and on distillation with potash, a volatile base with a fishy ammoniacal odour is formed. It is probably *allylia*, or allyl-amine (C_6H_7N or C_6H_5,H_2N), the basic volatile alkali of the allylic series, which has also been obtained by a different process, and corresponds to ethylia or ethyl-amine in the ethylic series.—Miller's *Elements of Chemistry*, 2d edit., 1862, vol. 3, pp. 574—584; Gorup-Besanez, *Lehrbuch d. Chemie*, vol. 2, pp. 266—272; and the recent memoirs of Berthelot and Luca, Hofmann and Cahours, &c.

GA'RNET, a precious stone, some of the varieties of which are of great beauty; while some are less highly prized than other not more beautiful minerals, because much more common. Garnets are found most generally in mica-slate, hornblende slate, and gneiss; less frequently in granite and granular limestone; sometimes in serpentine and lava. There are numerous varieties, differing considerably in chemical composition; anhydrous silicates of alumina and lime or magnesia, coloured with oxide of iron, of manganese, or of chrome. The colour is various, generally some shade of red, brown, black, green, or yellow. Colourless and white specimens also occur. Red garnets sometimes contain so much iron as to be attracted by the magnet. The coarser variety of G., known as Common G., is generally found massive, often forming a very considerable part of the rock in which it occurs, so as even to be used as a flux in the smelting of iron. Crystallised garnets are also often very numerous in the rock which contains them; the crystals are sometimes very small, almost imperceptible grains; sometimes they are as large as a man's fist. The primary form of the crystal is a cube, but the common secondary forms are a rhombic dodecahedron, and an acute double eight-sided pyramid, the summits of which are abruptly acuminated by four planes.—Noble G., or Precious G., also called *Almandine*, is generally of a crimson-red colour, sometimes of so deep a tint, that jewellers hollow it out beneath, or place at the back of it a plate of silver. It is sometimes transparent, sometimes only translucent. It is found in some of the mountainous parts both of England and Scotland, but the finest garnets are imported from Syriam, in Pegu. A Syriam G.,



Garnet:
1, a detached crystal; 2, portion of rock with imbedded crystals.

of a velvety black colour, without defect, is valued at about half the price of a blue sapphire of the same weight. The large specimens of the precious G. are generally engraved with figures, and thus acquire a very high value.—A variety of G., known as *Grossularia*, from its resemblance in form, size, and colour, to a green gooseberry, is brought from Siberia.—Cinnamon Stone (q. v.) is a variety of garnet.—Pyrope, Vesuvian, and Epidote are nearly allied to it.—Powdered garnets are often used for polishing and cutting other stones; this powder is known to lapidaries as *Red Emery*.

GARNISH, GARNISHMENT, GARNISHEE (Fr. *garnir*, to furnish). In English law, to garnish is to warn, and garnishment signifies a warning given to one for his appearance in court. But garnishment in its more usual sense is applied to the notice which a person sued in an action of detinue, and pleading the interest of a third party, is entitled to require to be served on that party. By the custom of London and certain other towns, a practice has existed from time immemorial, whereby a plaintiff suing in the local court was entitled to attach the property of the defendant in the hands of a third person, who was called the garnishee. See FOREIGN ATTACHMENT. But until the passing of the Common Law Procedure Act, 1854, there existed no means in England whereby a creditor could attach the property of his debtor in the hands of third persons in direct satisfaction of his claim. By sections 60—65 of this statute, it is now provided, that any one having obtained a judgment in one of the superior courts at Westminster, may require his debtor to be examined as to the debts due to him, and on the statement of the judgment debtor, all debts owing to him by third parties, called garnishees, may be attached in satisfaction of the plaintiff's claim. If the garnishee pay, he is forthwith discharged of the debt to his creditors, but if he fail to pay, and does not dispute the debt, the judge may order execution against him. It is to be observed that, under this statute, garnishment can still be obtained only where judgment has been obtained. Debts due to a defendant during the currency of an action, therefore, cannot be attached. In this respect, the remedy is less effectual than the custom of foreign attachment. In Scotland, debts due to a defender may be attached, both after judgment and on the dependence of an action. See ARRESTMENT.

GARNISHED, in Heraldry. Any charge is said to be garnished with the ornament set on it.

GARONNE (anc. *Garumna*), the principal river in the south-west of France, rises within the Spanish frontier in the Val d'Arán, at the base of Mount Maladetta, in the Pyrenees. About 26 miles from its source, it enters the French territory in the department of the Haute Garonne, flows in a general north-east course to Toulouse, then bends to the north-west, and continues to flow in that direction until, joined by the Dordogne, about 20 miles below Bordeaux, and widening afterwards into the estuary which bears the name of the Gironde, it enters the Atlantic at the Pointe de Grave. The basin of the G. is upwards of 200 miles in length, and about an equal extent in width at its broadest part; although narrowing in the north-west to a width of only 25 miles. The total length of the river is about 350 miles; and its natural navigation, which, however, is much impeded above Toulouse, commences at Cazères, 262 miles from its embouchure. At Bordeaux, the river attains a breadth of 1603 feet. Its principal affluents are the Tarn, Aveyron, Lot, and Dordogne, on the right; and on the left, the Save, Gers, and Baise. At Toulouse it is joined by the Canal du Midi, which, running eastward to the Mediterranean, forms with the G. a means of communication between that sea and the Atlantic. The valley of the G. is noted for the beauty of its scenery, and its abundant produce of corn and wine.

The estuary of the Gironde is 40 miles in length, and about 4 miles in average breadth. Below Blaye, its shores consist of bare rocks and bleak and dreary heath.

GARONNE, HAUTE, a department in the south of France, is bounded on the S. by the Pyrenees, and on the W. by the departments of Hautes Pyrenees and Gers. It has an area of 2369 square miles, and a population of 481,247. It is watered throughout by the Garonne, from which it derives its name, and within the basin of which it wholly lies. Occupied in the south by a branch of the Pyrenean range, the slope of the department, and the course of its streams, are toward the north and north-east, where the land is generally level. The soil is on the whole good; that in the valleys is remarkably productive, and brings forth heavy crops of grain, maize, flax, and potatoes. Orchard-fruits, with melons and tobacco, are produced in abundance, and the annual yield of wine is about 14,300,000 gallons, two-thirds of which is exported. Minerals also abound, but, with the exception of iron, have not yet been obtained in any great quantity. The chief manufactures are woollen and cotton fabrics and hardware; and these, with timber, cattle, wine, and preserved meats, are the principal exports. The department of Haute G. was formerly divided between the provinces of Languedoc and Gascony. It is divided into the four arrondissements of Toulouse, Maret, St Gaudens, and Villefranche, with Toulouse as capital.

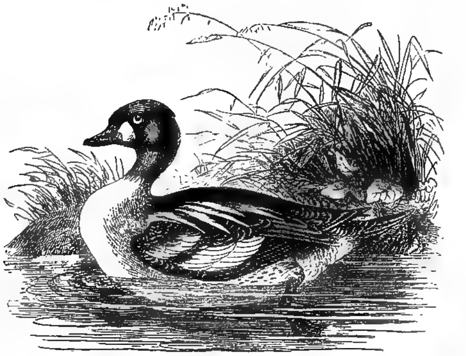
GARRICK, DAVID, actor and author, was born at Hereford in 1716, and educated at the grammar school of Lichfield. After a short residence at Lisbon with an uncle, who was a wine-merchant in that city, he returned to England, and in 1735 became a pupil of the famous Dr Johnson; but in the course of six months, master and pupil both proceeded to London, with the view of improving their fortunes. G. attempted the study of law, but an irresistible instinct soon urged him to the stage. He made his *début* at Ipswich in 1741, as Aboan, in the play of *Oroonoka*, and obtained a great success. Encouraged by this, he ventured to appear before a London audience in the autumn of the same year, and in the character of Richard III. was received with prodigious applause. The fashionable theatres were emptied to gaze upon the new star that was shedding an unwonted lustre on the obscurity of the Goodman's Fields' stage, and the other theatrical celebrities, such as Quin and Cibber, could not conceal their chagrin and disgust. In the following year, G. accepted an engagement at Dublin, where he excited the Hibernian enthusiasm to a miraculous degree. The playhouse, we are told, was so crowded, 'that a very mortal fever was produced, which was called Garrick's fever.' In 1747, he became joint-patentee of Drury Lane, and two years after, married Mademoiselle Violette, a foreign *danseuse;* a circumstance which, somehow or other, he feared might expose him to ridicule, and to prevent such a thing, he got his friend Mr Edward Moore 'to write a diverting poem upon his marriage.' This was not the only occasion when his sensitiveness to malicious banter induced him to forestall the wits and critics, and so blunt the edge of their jests and criticisms. Before acting Macbeth for the first time, he wrote a humorous pamphlet, reflecting on the 'mimical behaviour of a certain fashionable faulty actor,' to wit, Garrick himself. In 1763 he paid a visit to Italy, and in 1769 projected and conducted the memorable jubilee at Stratford-upon-Avon in honour of Shakspeare. He died in London, January 20, 1779, having accumulated a fortune of £140,000. G. ranks as one of the very greatest—perhaps *the* very greatest—of English actors. He exhibited a Shaksperian universality in the representation of character, and was equally at home in the highest flights of tragedy and the lowest depths of farce. But the *naturalness* which so wonderfully marked him on the stage, often forsook him in real life. He was jealous to an extreme, and had an unbounded stomach for flattery. His friend Goldsmith hits off his character happily in the poem, entitled *Retaliation.* As a dramatic author, G. does not hold a high place. He wrote about 40 pieces, some original, but mostly adaptations of old plays. His numerous prologues and epilogues, however, deserve considerable praise.

GA'RRISON (Fr. *garnison*, from low Latin *garnisio*, military furniture), the troops occupying a town or fortress, either for defensive purposes, or merely as ordinary quarters.

GARRISON, William Lloyd, a distinguished American abolitionist, the acknowledged leader of the advocates of immediate emancipation in the United States, was born at Newburyport, Massachusetts, in 1805. Before he was 20 years old, he had acquired no inconsiderable reputation by the articles which he contributed to the *Salem Gazette* and other newspapers. He became, in 1826, the conductor of a paper of his own, the *Free Press*, published at Newburyport; it was, however, unsuccessful, and was soon discontinued. In 1829, he became joint-editor of the *Genius of Universal Emancipation*, an anti-slavery journal published in Baltimore. This paper had previously advocated the gradual abolition of slavery; but Mr G., in the very first number that was issued after his connection with it, distinctly avowed the doctrine that immediate emancipation is the right of the slave, and the duty of the master. Having, soon after, severely denounced certain persons engaged in the domestic slave-trade, which he stigmatised as 'domestic piracy,' he was tried and convicted for a libel. Unable to pay the penalty imposed by the court, he was sent to prison, where he remained several weeks. At length, a generous friend paid the fine, and released him. On the 1st of January 1831, G. issued in Boston the first number of the *Liberator*, a weekly anti-slavery paper, with which his fame has since become indissolubly associated. The unsparing, not to say virulent denunciation with which G. assailed the institution of slavery and all those voluntarily, however remotely, connected with it, was not long in arousing attention in every part of the country; while it excited in the Southern States the utmost exasperation. Almost every day brought him letters from the South, containing threats of violence, and even assassination. At length, the legislature of Georgia went so far as to offer a reward of 5000 dollars to any one who should arrest and prosecute him to conviction under the laws of that state. Meanwhile, he was repeatedly mobbed at home, and his life was more than once in the utmost peril even in Boston. But nothing could turn him from his course. Although there has been some abatement in the tone of the *Liberator*, G. has not in a single material point modified his views in regard to slavery in the 31 years during which that paper has been published. The early severity of his denunciations, as his friends allege, with some show of reason, was necessary, in order to arouse the conscience of the nation from its apathy respecting the wrongs of the African race. It would perhaps be less easy to excuse the unsparing invective with which Mr G. has so often assailed those friends of emancipation who have thought it right to pursue a course different from his own.

It is proper to remark, that Mr G. and his devoted followers have always disclaimed any purpose of exciting the slaves to assert their own freedom by force. They profess to rely solely on arguments and 'moral suasion' addressed to the consciences of the dominant race. They are also non-resistants; and not only refuse to hold any office in the federal republic, but are conscientious even against voting for such an office, for they consider this would be an indirect acknowledgment of the rightfulness of a government supported by military power, and contaminated by a compromise with slavery.

GA'RROT (*Clangula*), a genus of the oceanic section of Ducks (q. v.), having the bill shorter than the head. One species, the Golden-eye (*C. vulgaris* or *C. chrysophthalmus*), a bird not quite so large as a widgeon, is a common winter visitant in Britain, appearing in small flocks, most frequently in severe weather, not only in estuaries, but on the lakes and rivers of inland parts of the country, as it does on those of all the central and southern parts of Europe, and equally on those of the temperate parts of Asia and North America. It breeds in arctic and subarctic regions, preferring wooded districts, and forms its nest either on the ground, in the crevice of a rock, or the hole of a tree. The parent birds are said to transport their young from the nest to the water, holding them under the bill, and supported by the neck. The Lapps take advantage of the predilection of the golden-eyes for making their nests in holes, by setting up boxes for them, and then robbing them of their eggs.—Another British species is the Harlequin G., or Harlequin Duck (*C. histrionica*), but it is only a rare winter visitant. Like the golden-eye, it is a native of the northern parts of the world generally. The male is curiously streaked and marked with white.—The Buffel-headed G., or Buffel-headed Duck (*C. albeola*), is of extremely rare occurrence in Britain, but is very common in North America, where it is often called the Spirit Duck, a name which is said to have been bestowed in allusion to its power of eluding observation by diving. It is rather smaller than the golden-eye and harlequin garrot. The flesh of the garrots is eaten, but not very highly esteemed.



Golden-eye (*Clangula vulgaris*).—Male.

GARRO'TTE (Spanish *garrote*, a stick or cudgel), a mode of execution practised in Spain and the

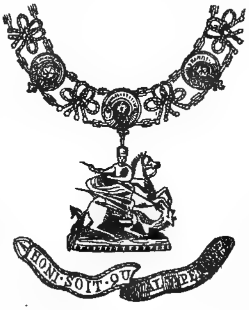
Spanish colonies. Originally, it consisted in simply placing a cord round the neck of a criminal, who was seated on a chair fixed to a post, and then twisting the cord by means of a *stick* (whence the name) inserted between it and the back of the neck, till strangulation was produced. Afterwards, a brass collar was used, containing a screw, which the executioner turned till its point entered the spinal marrow where it unites with the brain, causing instantaneous death. The inquisitors were wont to grant as a favour this mode of strangulation, before being burned, to such condemned persons as recanted. If the executioner was unskilful, however, the pain was sometimes very great. Llorente (*Hist. de l'Inq.*, t. iii. p. 472) mentions that at an *Auto da Fé* (q. v.) at Cuença, a poor Jew, who had obtained this dismal privilege of preliminary strangulation, noticing the bungling manner in which the executioner had performed the operation on the two who preceded him, said to the latter: 'Peter, if you are likely to strangle me so clumsily, I would much rather be burned alive.' The same process was also applied as a species of torture to the limbs, or to such portions of the body as might be injured with comparative impunity. It is probable that the Spaniards adopted the garrotte from the Moors; at all events, in its primitive form, it exactly resembles the punishment of the bowstring in use among Mohammedan nations.—Garrotting is also the name given in England and Scotland to a species of robbery which has recently become rather common, in which the robbers suddenly come behind their victim, and throwing a cord, or handkerchief, or something of the sort, round his neck, produce temporary strangulation till their purpose is effected.

GARROVILLAS-DE-ALCONETAR, a small town of Spain in the province of Caceres is situated 20 miles north-west of the town of that name, on the left bank of the Tagus. It has manufactures of linen and woollen fabrics, and some trade in grain, cattle, and fruit. Pop. 6573.

GARTER. See Bend.

GARTER, Order of the. The order of the garter was instituted by King Edward III., and though not the most ancient, is one of the most famous of the military orders of Europe. Selden says that it 'exceeds in majesty, honour, and fame all chivalrous orders in the world.' It is said to have been devised for the purpose of attracting to the king's party such soldiers of fortune as might be likely to aid in asserting the claim which he was then making to the crown of France, and intended as an imitation of King Arthur's round table. The round table was erected at Windsor, and the knights and nobles who were invited from all parts of the world were exercised at tilts and tournaments as a preparation for the magnificent feasts that were spread before them. That general 'jousts and tournaments' of this description were held at Windsor, is known from the letters summoning them bearing date 1st January 1344, and quoted by Sir Harris Nicolas in his *Orders of Knighthood*, i. p. 6; and from the narrative of Froissart, who connects them with the institution of the order. The original number of the knights of the garter was twenty-five, his majesty himself making the twenty-sixth. The story that the Countess of Salisbury let fall her garter when dancing with the king, and that the king picked it up and tied it round his own leg; but that, observing the jealous glances of the queen, he restored it to its fair owner with the exclamation: *Honi soit qui mal y pense*, is about as well authenticated as most tales of the kind, and has, moreover, in its favour that it accounts for the otherwise unaccountable emblem and motto of the order. Sir Harris Nicolas, whose error does not usually lie in the direction of credulity, says, that though the writers on the order have treated it with contempt, they have neither succeeded in shewing its absurdity, nor suggested a more probable theory.

Star of the Order of the Garter.



Collar, Badge, and Garter.

Various dates are assigned to the order of the garter. Froissart, as above mentioned, gives 1344, and fixes on St George's day (23d April), 1344; but Stow, and, it is said, the statutes of the order, fix it six years later—viz., 1350. The original statutes have long since perished, and little reliance can be placed on the modern copies of them, and nothing is known on the subject with precision till the compilation of the *Black Book* in the latter part of the reign of Henry VIII. In these circumstances, Sir Harris Nicolas is of opinion, that, though founded at the former period, it was not till the latter that the order was finally organised, and the companions chosen. It was founded in honour of the Holy Trinity, the Virgin Mary, St Edward the Confessor, and St George; but the last, who had become the tutelary saint of England, was considered its special patron; and for this reason it has always borne the title of 'The Order of St George,' as well as of 'The Garter.' A list of the original knights, or knights-founders, is given by Sir Harris Nicolas.

The well-known emblem of the order is a dark-blue ribbon edged with gold, bearing the motto *Honi soit qui mal y pense*, in golden letters, with a buckle and pendant of gold richly chased. It is worn on the left leg below the knee. The mantle is of blue velvet, lined with white taffeta, and on the left breast a star is embroidered. The hood and surcoat are of crimson velvet, lined with white taffeta. The hat is of black velvet, with a plume of white ostrich feathers, in the centre of which there is a tuft of black herons' feathers, all fastened to the hat by a band of diamonds. The collar is of gold, and consists of 26 pieces, each in the form of a garter. The 'George' is the figure of St George on horseback encountering the Dragon; is worn to the collar, and there is a 'lesser George' pendent to a broad dark-blue ribbon over the left shoulder. The Star, which is of eight points, is silver, and has upon the centre the Cross of St George, gules, encircled with the garter. The officers of the order are—the Prelate (the Bishop of Winchester), the Chancellor (the Bishop of Oxford), the Registrar (the Dean of Windsor), the Garter King of Arms (q. v.), and the Usher of the Black Rod.

GARTER KING OF ARMS is also the Principal King of Arms in England. Though held by the same person, they are distinct offices. The first was instituted for the service of the order of the Garter (see Garter), not on its first foundation, but afterwards by Henry V. as sovereign, with the advice and consent of the knights-companions. The peculiar duty of Garter King of Arms is to attend upon the knights at their solemnities, to intimate their election to those who are chosen by the order, to call them to be installed at Windsor, to cause their arms to be hung up over their stalls, and to marshal their funeral processions, and those of royal personages, and of members of the higher nobility. In the capacity of principal King of Arms, he grants and confirms arms, under the authority of the Earl Marshal, to whom he is not subject as Garter King of Arms. All new grants or patents of arms in England are first signed and sealed by Garter King of Arms, and then by the king of the province to which the applicant belongs. See HERALD'S COLLEGE.

GARTH, SAMUEL, an eminent physician, and a poet of considerable reputation, was born at Bolam, in the county of Durham, in 1660. He was a member of Peterhouse, Cambridge, and graduated as M.D. in 1691. In the following year, he settled in London, and was admitted into the College of Physicians, in which institution he subsequently held several important offices. His professional skill was associated with great conversational powers, and he soon acquired a very extensive practice. The year 1700 presents an incident in G.'s life which did him everlasting honour. He it was who stepped forward to provide a suitable interment in Westminster Abbey for the neglected corpse of Dryden, which he caused to be brought to the College in Warwick Lane; and he pronounced a eulogium over the great poet's remains. On the accession of George I., he received the honour of knighthood, was appointed physician in ordinary to the king, and physician-general to the army. He died in London, January 18, 1718.

G. is best known in our literary history as the author of *The Dispensary*, a poetical satire on the apothecaries and those physicians who sided with them in opposing the project of giving medicine gratuitously to the sick poor. The sketches of some of his contemporaries—as, for instance, Drs Gould, Tyson, and How, who are introduced into the poem as 'obsequious Umbra,' 'slow Carus,' and 'shrill Querpo'—are severe; and although, doubtless, exaggerated by poetic licence, must have been true to nature, or the work could not have obtained such an immediate and extensive circulation. The first edition came out in 1699, and the second and third followed in the course of a very few months. In 1706, he brought out the sixth edition with considerable additions. In 1715, he published a poem entitled *Claremont*, and in 1717 he superintended and contributed to a translation of Ovid's *Metamorphoses* by some of the most eminent writers of that age—Addison, Pope, Gay, Congrieve, and Rowe being amongst the contributors.

Pope frequently refers to him, both in his letters and in his poems, with great respect—

> And we, too, boast our Garth and Addison.

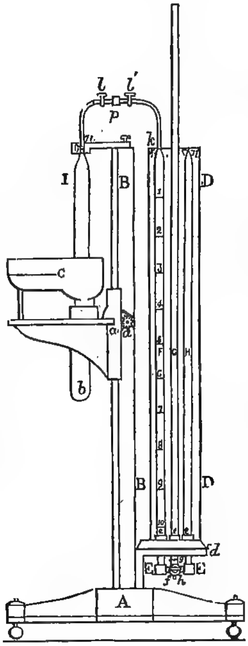
The second *Pastoral* was dedicated to G.; and in a letter to Jervis in 1718, Pope states that he entertains 'the truest concern for his loss.'

GÄRTNER, FRIEDRICH VON, a distinguished German architect, was born at Coblentz in 1792. His father, also an architect, removed in 1804 to Munich, where young G. received his first education in architecture. To complete that education, he travelled in 1812 to Paris, and in 1814 to Italy, where he spent four years in the earnest study of antiquities. The fruits of this labour appeared in 1819 in some views, accompanied by descriptions, of the principal monuments which have been preserved in Sicily (*Ansichten der am Meisten erhaltenen Monumente Siciliens, Lithographien mit erläuterndem Text*). After a visit to England, he was called, in 1820, to the chair of Architecture in the academy of Munich. With this appointment began his work as a practical architect. Many of the architectural ornaments of Munich, and various other buildings throughout Germany, as well as the new royal palace at Athens, are built after his plans. In the style of his works, which have all a common impress, G. represents the renaissance of the medieval architecture in its Romanesque forms. The round arch with its accompaniments prevails in them all. G. was rewarded with the fellowship of several academies, with orders of his own and foreign countries, with a degree from Erlangen, with the office of head government-surveyor of buildings, and with the directorship of the Academy of Arts in Munich. He died in the midst of his labours, 21st April 1847.

GARTSHE'RRIE, a village of Lanarkshire, in the parish of Old Monkland, is noted for its extensive ironworks. In the immediate neighbourhood are the ironworks of Dundyvan, Clyde, and Calder, all of which, together with Coatbridge, contribute to the iron-trade of Glasgow. See article LANARKSHIRE.

GAS, ANALYSIS OF. This department of analysis originated in the attempts of various chemists, during the last quarter of the 18th, and the first quarter of the present century, to determine the volume of oxygen in specimens of atmospheric air taken from different localities. The general principle on which the early Eudiometers (q. v.) were constructed, was that of exposing atmospheric air to the action of some substance which combined with its oxygen. Various eudiometers and eudiometrical processes were devised by Priestley, De Marté, Guyton, Seguin, Volta, Berthollet, Hope, Henry, Pepys, Ure, &c., which are now only of interest in an historical point of view. They were not only almost exclusively limited to the determination of the quantity of oxygen, but they were more or less imperfect in their action; and the analysis of the gases generally did not become developed into a system until Professor Bunsen of Heidelberg, some 20 years ago, began to devote himself to the subject. Ingenious instruments for the analysis of gaseous mixtures have recently been devised, not only by Bunsen, but by Regnault and Reiset, Williamson and Russell, and Frankland and Ward. The instrument devised by the last-named gentlemen we shall presently describe; but before doing so, we must say a few words on the collection of gases for analysis. In collecting gases, we usually employ small glass vessels, the contents of which, consisting of water, mercury, or air, are displaced by the gas to be analysed. Of these three fluids, water is the least capable of general application, inasmuch as it gives rise to phenomena of absorption and diffusion, which modify the composition of the gas that is to be collected, and gases are more or less soluble in it. For the best methods of collecting gases from mineral springs and waters, from volcanic lakes, geysers or boiling springs, from openings in rocks, clefts of glaciers, furnaces, fissures in volcanic craters, &c., we must refer to Bunsen's *Gasometry*, translated by Roscoe, 1857. Again, it must be recollected that the nature of the gas that is evolved often varies with the progressive phases of a decomposition, as, for example, in the process of coking, or in the phenomena of combustion and decomposition occurring in the strata of a furnace. In these cases, it is necessary to collect a series of specimens during the progress of the decomposition.

Our limited space will not allow of our entering into the various details of the complicated apparatus employed by Frankland and Ward, which is regarded as the best that has yet been invented. A full account of it may be found in their Memoir in the *Quarterly Journal of the Chemical Society*, or in Williams's *Handbook of Chemical Manipulation*. The following remarks, which we take with slight modifications from their Memoir, will, we trust, sufficiently explain the manner of using this apparatus. We take as an example an analysis of atmospheric air. A few (three or four) cubic inches of air, freed from carbonic acid, having been introduced into the tube I, it is transferred into F for measurement by opening the cocks *l*, *l'*, and placing the tube F in connection with the exit-pipe *h*; the transference can be assisted, if necessary, by elevating the mercurial trough C. (The part marked *b* in the figure is merely the tubular well of the mercurial trough C.) When the air, followed by a few drops of mercury, has passed completely into F, the cock *l* is shut, and *f* turned, so as to connect F and H with *h*. Mercury is allowed to flow out until a vacuum of two or three inches in length is formed in H, and the metal in F is just below one of the graduated divisions; the cock *f* is then reversed, and mercury very gradually admitted from G, until the highest point in F exactly corresponds with one of the divisions upon that tube: we will assume it to be the sixth division, there being ten divisions in all. This adjustment of mercury, and the subsequent readings, can be very accurately made by means of a small horizontal telescope, placed at a distance of about six feet, and sliding on a vertical rod. The height of the mercury in H must now be accurately determined; and if from the number thus read off, the height of the sixth division above the zero of the scale in H is deducted (the scale on H is not marked in the figure), the remainder will express the true volume of the gas, no corrections being required for variations of temperature, atmospheric pressure, tension of aqueous vapour, &c.



A, a tripod, with levelling screws; BB, a vertical pillar, to which is attached, C, a mercurial trough, movable by a rack and pinion, *aa*; DD, a glass cylinder, 36 inches long, with an internal diameter of 4 inches, containing three tubes, F, G, H, which communicate with one another and with the exit-pipe, *h*, by the apparatus E *f* E. The rest of the figure will be sufficiently intelligible from the description given in the text.

Hydrogen, in the proportion of half the volume of the air used, must now be passed into I, and from thence into F, when the volume of the mixed gases must be again determined, as before. An electric spark must now be passed through the mixed gases in F by means of the platinum wires at *m*. A slight explosion occurs, after which we observe a considerable contraction in the volume of the mixed gases. The determination of this contraction terminates the analysis. One third of the contraction thus determined represents the volume of oxygen contained in the air submitted to analysis, and in this case, as oxygen and nitrogen were the only gases present, the estimation of the former also determines the latter. Such an analysis as that which we have described is termed a direct determination; in other cases, we employ an indirect method.

1. The method of direct determination is applicable to mixtures of the following gases: carbonic acid, oxygen, olefiant gas, and carbonic oxide. If all these gases are present in the specimen to be analysed, a few drops of a concentrated solution of potash is introduced into the apparatus, after a measured quantity of the gas has been transferred to it as before; the carbonic acid is speedily absorbed by the potash, and converted into carbonate of potash. The remaining gas is remeasured at the same pressure as before, and the difference of the two measurements represents the volume of the carbonic acid that was present. The remaining gas is next brought into contact with a few drops of a strong solution of pyrogallic acid, which is introduced into the apparatus. In a few minutes, the whole of the oxygen is absorbed by the acid solution, which assumes a deep blood-red colour. The remeasurement of the gas at the original pressure gives the volume of oxygen in the mixture.

The absorption of the olefiant gas is effected by the introduction into the tube I of a coke-bullet saturated with a solution of anhydrous sulphuric acid in oil of vitriol. This absorption occupies far more time than that of the preceding gas, an hour or more being required, and the residual gas contains sulphurous acid and the vapour of anhydrous sulphuric acid, which must be removed by a few drops of a strong solution of potash. The residual gas being again measured in F, the diminished pressure represents the volume of olefiant gas. The carbonic oxide is then determined by a solution of dichloride of copper, which is best prepared by allowing a concentrated solution of the protochloride to be in contact with copper turnings in a stoppered bottle for some days. The gas must be brought in contact for ten minutes with a little of this solution, introduced into the apparatus. The pressure of the gas is again measured, and determines the volume of carbonic oxide that has been absorbed. This gas is, however, usually determined by the indirect method.

2. The method of indirect determination is especially applicable to mixtures of the following gases: hydrogen, light carburetted hydrogen, carbonic oxide, and nitrogen. We explode a known volume of the mixture of these gases in the tube F, with an excess of oxygen, and determine (1) the diminution of volume after the explosion, and (2) the volume of carbonic acid produced by the combustion. The gas that remains after the absorption of the carbonic acid (by a solution of potash), consists merely of nitrogen, with any excess of oxygen beyond what was necessary. The volume of oxygen determined by explosion with hydrogen, subtracted from the residual gas, gives the amount of nitrogen contained in the mixture. For the determination of the respective volumes of nitrogen, hydrogen, carbonic oxide, and light carburetted hydrogen, we have the

following data—viz. (1) the volume of the gas taken for analysis, which we will call A; (2), the volume of the combustible gases contained in it, which we will call A′, and which is ascertained by deducting from A the amount of nitrogen determined as above; (3), the contraction of volume on explosion, which we will call C; and (4) the volume of carbonic acid generated on explosion, which we will call D; and we likewise know that on exploding one volume of hydrogen with an excess of oxygen, the contraction of volume is expressed by 1·5; that on similarly exploding one volume of carbonic oxide, the contraction is expressed by 0·5, while one volume of carbonic acid is produced; and that with light carburetted hydrogen the contraction is represented by 2·0, while one volume of carbonic acid is produced. Hence, if we call w, x, y, z, the unknown volumes of nitrogen, hydrogen, carbonic oxide, and light carburetted hydrogen, we see at once that $w = A - A'$, and $x = A' - D$; and the above numerical data give us the equations

$$C = \frac{3x}{2} + \frac{y}{2} + 2z, \quad \text{and } D = y + z; \text{ whence}$$

$$y = \frac{3A' - 2C + D}{3}, \text{ and } z = \frac{2D - 3A' + 2C}{3},$$

which affords the complete solution of the analytical problem.

If, on the application of these formulæ to the results of an analysis, one of the quantities w, x, y, z is found $= 0$, or a small negative result, it obviously follows, that the gas whose volume is represented by the letter in question, is not present in the mixture.

For further details regarding this somewhat difficult branch of chemical analysis, we must refer to Bunsen's treatise, and to the articles 'Analyse für Gase,' in the second edition of Liebig, Poggendorff, and Wöhler's *Handwörterbuch der Chemie;* and 'Gasometric Analysis,' in the *English Cyclopædia*—Arts and Sciences, vol. iv.

GAS (Lighting by) is the best and most economical mode of obtaining artificial light as yet brought into use; though hardly known at the beginning of the present century, it has since been gradually extending. It may now be said to be universal in the cities and towns of Europe; it is making rapid progress in North America, where it has long been used in the principal cities of the United States and of Canada, and it is spreading rapidly in the smaller towns. Its introduction into South America and into Asia has been more recent, and its progress there, as might have been expected, is much slower. It has also been introduced into the principal towns in Australia and Tasmania.

From 1658 to 1739, the attention of men of science in England had been repeatedly turned to the streams of inflammable air issuing from wells and mines in the coal districts, various communications on the subject having been read before the Royal Society of London. In the last-mentioned year, the Rev. Dr John Clayton, dean of Kildare, gave an account of experiments in which he had distilled gas from coal. It was not, however, till 1792 that the possibility of applying gas, distilled from coal, to the production of artificial light was demonstrated. In that year, Mr William Murdoch constructed apparatus by which he lighted his house and offices at Redruth, in Cornwall. In 1798, he lighted part of the manufactory of Messrs Bolton and Watt at Soho, and in 1805 he lighted the cotton-mills of Messrs Phillips and Lee at Salford. A proposal was made by M. Le Bon to light a portion of Paris with gas in 1802. In the succeeding year, Mr Winsor commenced lecturing on the subject in London. He being a man of a sanguine and enthusiastic temper, his strong statements probably tended to retard rather than advance the new art. He promised to every depositor of £5 an income exceeding £500 per annum, and he urged the government to take the matter into their own hands, as a certain means not only of clearing off the national debt, but of securing a permanent and large revenue to the country. The chartered Gas Company of London, which was the first company incorporated, obtained their act of parliament in 1810. At that time, Mr Winsor, who had been instrumental in establishing the company, was employed by them, but in 1813 they found it necessary to engage the late Mr Samual Clegg, who, from the year 1805, had been engaged in promoting the use of gas, and to whose ingenuity and scientific skill the chartered company, as well as the community, were greatly indebted. Mr Clegg was the inventor of the hydraulic main, of the wet-lime purifier, and of the wet gasmeter, all which were essential to the success of gas lighting.

As the first gas applied to artificial lighting was obtained from coal, so, owing to the economy attending its manufacture, the use of any other material only occurs when coal cannot be obtained except at an exorbitant price, and where other gas-yielding materials are unusually cheap. Resin and oils are the best substitutes for coal.

Destructive distillation by the action of heat is in all cases the means employed to disengage the gas from the raw material, the apparatus and processes being modified to suit the material operated upon. As the manufacture of coal-gas is not only the most general, but also the most interesting of these processes, and as the mode of storing, distributing, and using the gas is the same in all, the manufacture of coal-gas only will be here described.

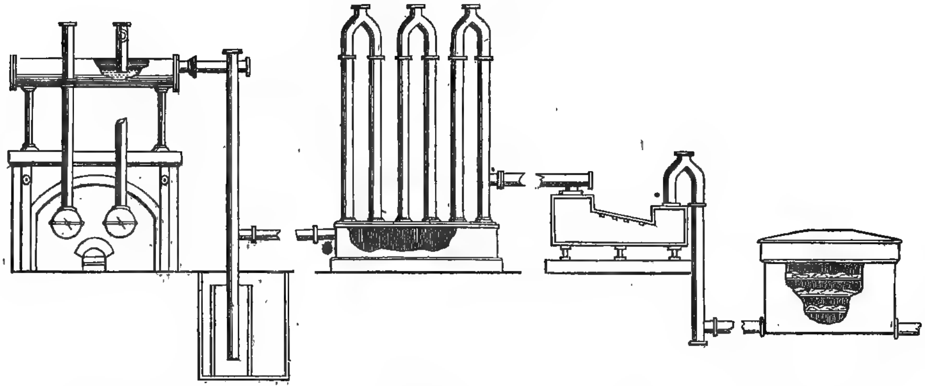
As a branch of manufacturing industry, coal-gas-works occupy an important position, not only from the immense capital permanently embarked, and the great number of hands employed in them, but also from the demand created by them for coal, lime, &c., and for ironwork, brasswork, and gasmeters. In London alone, the aggregate share capital of 17 gas companies amounts to £5,000,000, independently of large sums of borrowed capital. In England, there are above 400 gas companies; in Scotland, above 180; in Ireland, above 60; and there are in the three kingdoms about 130 gas-works, the property of individuals or of corporations. The coals best adapted for the manufacture of gas, are those known in England by the name of cannel, and in Scotland by the name of parrot coals. The English caking coals, of which a great part are obtained in the neighbourhood of Newcastle-on-Tyne, are, however, from their cheapness and the superior quality of the coke which remains after distillation, more extensively used than any other. In Scotland, parrot coals are used almost exclusively. Cannel is used exclusively in Liverpool, Manchester, and some other towns; a proportion of cannel or of Scotch parrot is used with caking coal in London and other places to improve the quality of the gas, but in England generally the gas is made from caking coal. The coke of the English cannel coals is of fair quality, though inferior to that of the caking coals. The coke of the Scotch parrot coals is very inferior, that of some being altogether worthless.

The English caking coals yield from 8000 to 10,000 cubic feet of gas per ton, of illuminating power varying from 10 to 12 sperm candles to a burner consuming five feet per hour. The English cannel coals yield about 10,000 cubic feet per ton, of illuminating power varying from 20 to 24 sperm candles. The Scotch parrot coals are very various in quality, yielding from 8000 up to 13,000 cubic feet per ton, varying in illuminating power from 16 up to 35 candles. As a general rule, the parrot coals which yield the greatest quantity of gas, yield also gas of the highest illuminating power.

In the process of distillation, gas, tar, and ammoniacal liquor come off together, and are separated by the action of the apparatus employed—a large residuum of coke remains in the retort. The gas consists of a mixture of heavy carburetted hydrogen (olefiant gas), specific gravity, 985; heavy hydrocarbon vapours of various kinds; light carburetted hydrogen, specific gravity, 555; sulphuretted hydrogen, specific gravity, 1191; sulphide or sulphuret of carbon in minute quantity; carbonic oxide, specific gravity, 972; carbonic acid, specific gravity, 1524.

The value of coal-gas depends on the proportion of olefiant gas and heavy hydro-carbons which it contains. Great attention is required in heating the retorts; if their temperature be too low, the tar and liquor are increased in quantity, and the gas diminished in quantity and deteriorated in quality. If the temperature be too high, the olefiant gas is decomposed, and light carburetted hydrogen formed. While different parts of the apparatus necessary for producing, purifying, storing, and sending out the gas are capable of many variations in size, form, and construction, the order in which they come into use is almost invariable. First there are the *retorts*, *ascension* and *dip pipes*, *hydraulic main*, then the *tar-well* and *condenser*, the exhauster, the washer or scrubber, the *purifier*, the station-meter, the *gasholder*, and the governor—the parts printed in italics being indispensable. Besides the above, valves of various forms, simple and complicated, are employed. These, in some of their arrangements, display great ingenuity. Water-traps also have to be applied for collecting and removing the water and tar which condense in the pipes. The annexed wood-cut shews an arrangement common in small gas-works.

ELEVATION OF GAS-WORKS.



Retorts, &c. Tar Well. Condenser. Washer. Dry-Lime Purifier.

The retorts are now generally made of fireclay, though cast-iron retorts are still frequently to be met with. They are made D-shaped, cylindrical, kidney-shaped, and elliptical. The sizes most common are from 6 to 9 feet in length, and from 12 to 20 inches in diameter. In large works, two 9-feet lengths are joined together, forming one retort 18 feet long, with a mouth at each end—a mode of construction which is found to possess considerable advantages. The retort is built horizontally into an arched oven, in such a manner as to be equally heated throughout from a furnace beneath. From one to seven retorts, and sometimes a greater number, are set in the same oven. The open mouth-piece of the retort is of cast iron, and projects outwards from the front wall of the oven sufficiently far to admit between the mouth and the front of the oven, an opening to which the ascension-pipe is connected for conveying the gas to the hydraulic main. When the coal to be distilled is introduced into the retort, the mouth is closed with a lid, which is kept tight by a luting of clay or other material round the edge, and made fast with a screw.

The hydraulic main is a large pipe made of thick plate or cast iron. It is first about half filled with water, which in the course of a short time is entirely displaced by the liquid product of distillation. The dip-pipes, which are the continuation of the ascension-pipes, dip into the liquid through which the gas bubbles up into the upper portion of the hydraulic main. The gas and liquid come off at the end of the hydraulic main, and flow together till they reach the tar-well, into which the liquid, by its greater gravity, falls. The liquid consists of tar and ammoniacal water. These are withdrawn from the tar-well, and become the raw material from which other products are manufactured. From the tar, naphtha, pitch-oil, pitch, and coke are obtained; and from the water, salts of ammonia are prepared. The tar and ammoniacal water being of different densities are easily separated by being allowed to settle in a vessel. See Gas-tar, Naphtha, Ammonia, Sal-ammoniac, &c. When a retort is opened for withdrawing the exhausted charge of coal and renewing it, the pressure of the gas on the hydraulic main forces the liquid to ascend the dip-pipe, and thus seals it against the gas in the hydraulic, which, but for this, would rush up the dip-pipe, descend the ascension-pipe, escape and ignite at the open mouth of the retort. In the tar-well there is also a dip-pipe, inserted into a deep vessel, to prevent the gas from entering the well. A similar contrivance is resorted to wherever it is necessary to introduce or draw off liquids at any part of the apparatus. The tar-well must be placed so low, that all the liquid in the pipes leading to it from the hydraulic main, and from it to the condenser, must incline towards it.

The simplest form of condenser consists of a series of upright pipes, each pair being connected at the top by an arch pipe. These are erected upon a horizontal chest, the top of which has an opening into the bottom of each upright pipe. Immediately under the centre of each arch pipe, a plate descends from the top of the chest, and reaches to within a few inches of the bottom. When in operation, the chest is always filled with liquid to such a height, that these plates dip into it, and prevent the gas from passing through the chest horizontally. When admitted into the chest, the gas finds no exit but by ascending the first upright pipe; and, passing over the arch, it descends to the chest again through the second upright pipe. There being no dip-plate between the second and third upright pipes, the gas ascends the third pipe and descends the fourth, and so on through the condenser. The upright pipes are kept cool by exposure to the atmosphere, and sometimes a thin stream of water is caused to flow over them. As the gas ascends and descends, cooling rapidly in its passage, the liquid which has been carried along in a state of vapour, condenses, and falls into the chest, from which it is conveyed back by an overflow-pipe to the tar-well.

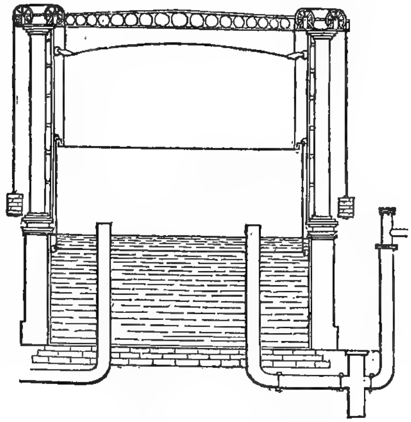
The exhauster, when used, is now the next part of the apparatus. It is a species of pump, driven by steam-power, and is made in various forms, both direct-acting and rotary. It serves the purpose of relieving the retorts of the resistance or pressure, created in the passing of the gas through the apparatus, and in raising the gasholders. The use of the exhauster greatly lessens the deposit of carbon in the retorts in the form of graphite, and is attended with other important advantages.

At this stage of the process, the liquid products have been separated from the gaseous. A portion of the ammonia and the sulphuretted hydrogen and carbonic acid have still to be removed. As yet, there are no means practically applicable for the removal of the sulphide of carbon; but the quantity produced is so minute as to be uninjurious, and sufficient ammonia remains in the gas to form the harmless salt sulphate of ammonia as the product of combustion. To remove ammonia from the gas, the washer or scrubber is used. In the washer, the gas is forced to pass through water to a depth of several inches, or through a solution containing an ingredient with which the ammonia will combine. The scrubber, which may be used instead of the washer, is an upright vessel, in which the gas is made to pass through brushwood, or layers of small stones, or coke, through which water may be made to percolate.

There are two kinds of purifiers—the wet and the dry. Either may be used separately, or they may be used in succession. Lime is the purifying material which is most effective; a preparation of the oxide of iron, however, is rapidly coming into general use. Lime is used in the wet purifier in the form of cream of lime. The wet purifier is a cylindrical vessel, into which the gas is introduced through a wide pipe, which descends through the centre of the vessel, and is furnished with a very broad flange on the lowest part. The vessel is filled with the cream of lime to the height of several inches above the flange of the wide pipe. The gas enters through the wide pipe, passes under the flange, and upwards through the cream of lime. The cream of lime is kept in agitation by revolving arms. Two or more of these vessels must be used in succession, in order effectually to remove the sulphuretted hydrogen. The dry purifier is a square or oblong vessel containing a series of perforated trays, on each of which the purifying material is spread. Slacked lime (in the form of dry hydrate) is used in this purifier in layers of from 2½ to 3½ inches on each tray. The lime absorbs the sulphuretted hydrogen, a portion of the ammonia, and the carbonic acid. When saturated, it is removed, and the vessel is refilled with fresh material. The refuse lime is extensively used as a manure. When the oxide of iron is employed as the purifying material, the preparation is spread in the same manner as the lime, but to a much greater thickness. When by the absorption of sulphuretted hydrogen, the oxide of iron has become sulphuret of iron, it is taken out, and by exposure to the atmosphere, it is reconverted into oxide, and can be used again and again. A great recommendation for the use of the oxide of iron is the abatement of the annoyance caused by the unpleasant smell of the refuse lime. When oxide of iron is used, a separate lime purifier is necessary for removing the carbonic acid. A narrow chamber, nearly full of water, runs round the upper edge of the dry purifier; into this chamber the sides of the cover, which is of sheet-iron, are let down, and the gas is thus prevented from escaping.

After passing the purifier, the gas, which is now fit for use, is measured by the station-meter, an instrument similar in principle to the consumers' meter, afterwards described. It is then conveyed to the gasholder, to be stored and issued as required.

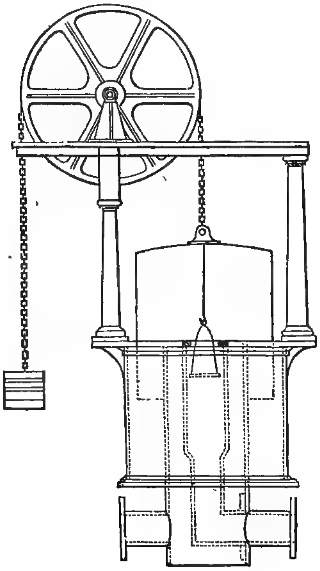
The gasholder is an inverted cylindrical vessel of sheet-iron, placed in a tank of cast iron, stone, or brick containing water. A pipe ascends from the bottom of the tank through the water, to admit the gas to the space between the surface of the water and the crown of the gasholder. Another pipe descends through the water and the bottom of the tank, for the issue of the gas to the main-pipe. The water is for the purpose of retaining the gas within the vessel. The buoyancy of the gas raises the gasholder, and the weight of the gasholder, or such part of it as is not taken off by balance-weights, impels the gas through the pipes. When balance-weights are necessary, they are attached to the edge of the crown of the gasholder by long chains, which pass over pulleys on the top of columns which serve also to guide the motion of the vessel in rising and falling. Gasholders are constructed of all sizes up to 200 feet in diameter, and are made to contain quantities up to two and a half millions of cubic feet. In large establishments, telescopic gasholders are used, and economy of space and cost are thereby effected—two concentric gasholders being contained in one tank. The outer vessel of a telescope gasholder has no crown. The upper edge is turned first inwards and then downwards, forming an inverted hollow chamber. The under edge of the inner vessel again is turned outwards and upwards, forming a hollow chamber, which, when the vessel rises out of the tank, will be full of water. The



Telescope Gasholder.

inner side of the inverted chamber, round the top of the outer vessel, fits into the inside of the chamber round the bottom of the inner vessel, and enters it when that vessel has nearly ascended to the top of the tank. The water in the chamber retains the gas, and the two vessels then rise together. The inner vessel, it will be observed, ascends first; both then ascend and descend together, till the outer vessel has reached the bottom of the tank, on which it rests, and the inner vessel then also descends into the tank. Three gasholders, or lifts, as they are termed, are occasionally placed in the same tank.

Before reaching the main-pipes, the pressure of the gas is regulated by the governor. In small establishments, the governor is very frequently dispensed with, and the pressure adjusted with sufficient nicety by the regulation of the outlet valve. The governor consists of a small gasholder, the inlet-pipe to which is placed in the centre of the tank, and terminates with a plate having a circular orifice in its centre. In this orifice hangs a cone, which is attached to the crown of the small holder. When the gas is issuing slowly, the holder rises, taking with it the cone, and so restricting the orifice by which the gas enters. When the gas issues rapidly, the holder falls, and with it the cone, thereby enlarging the inlet.



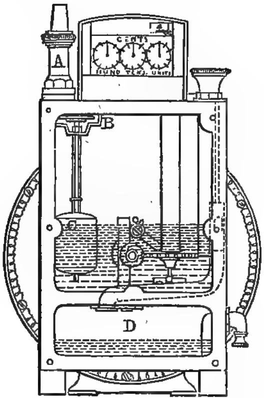
Gas Governor.

The gas is conveyed from the works by main-pipes of cast iron, to which branch or service pipes are connected wherever a supply is wanted. The main-pipes require to be skilfully arranged with respect to size, carefully jointed, and laid with as few changes in their inclination as possible; but as such changes are unavoidable, it is necessary to provide for the removal of water, which, flowing along with the gas in the form of vapour, condenses in the pipes, and lodges at low points. For this purpose, a vessel, similar in construction to the tar-well, is connected to the main-pipe, and the water is removed by a pump. When little condensation is anticipated, and when there is no risk of the water affecting the flow of the gas, a small pipe merely is attached to the main, with a stop-cock to run off the water. The service-pipes should incline towards the main; and where this cannot be attained, provision should be made for drawing off water.

Gas-fittings.—The small pipes for fitting up the interiors of houses are either of wrought iron or of soft metal. To ensure permanent efficiency, it is of the utmost importance that these pipes should be *capacious;* they should be laid *evenly*, with an inclination towards the meter; and where the inclination is materially disturbed, a box should be provided for the collection and removal of water.

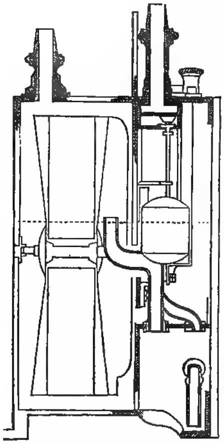
Gas for street lighting is usually supplied by contract, a specified burner being used, and the lights being lighted and extinguished at stipulated hours. Lights in private establishments were originally charged for on the same system. The uncertainty of such a mode of charge directed the attention of gas-engineers to the construction of meters at a very early period. Accordingly, in 1816, Mr Clegg took out his first patent for the wet gasmeter, which, as subsequently improved by Malam, Crosley, and others, came into general use about the year 1822. Dry gasmeters are now extensively manufactured on a principle first patented by Mr A. A. Croll, a gentleman who has also patented various modifications of the apparatus and processes used in the manufacture and purification of gas.

The wet gasmeter consists of a hollow circular case, somewhat more than half filled with water. The measurement is made by the cylinder, a hollow drum or wheel, which revolves on a horizontal axis inside the case, the elasticity of the gas supplying the motive-power. The cylinder is divided into four chambers by partitions running in a slanting direction from back to front, and presenting a section of a four-threaded Archimedean screw. A convex cover is fixed on one end of the cylinder. This cover has an opening in the centre, which admits the pipe by which the gas enters the cylinder; the opening being below the surface of the water, so as to be sealed by it. The pipe, after entering the opening, is turned up, so that its mouth is above the water. The gas thus admitted within the cover, finds its way through a slit into one of the four chambers into which the cylinder is divided. The chamber which first comes into action is at the moment almost entirely under the water. The gas presses between the water and the partition of the chamber, and, in raising the partition, turns the cylinder on its axis, and brings the chamber above the water, filling it at the same time. The outlet slit of the chamber is on the side of the cylinder



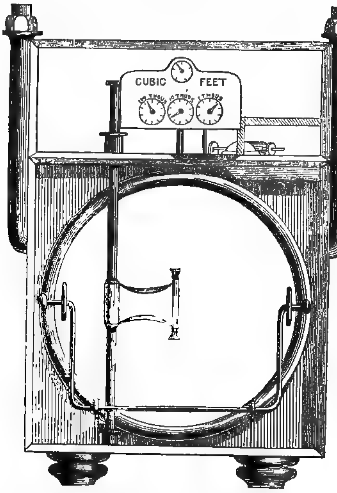
Wet Meter—front box open:
A, entrance pipe; B, valve chamber; C, float, with valve on the upper end; D, surplus or waste-water box.

opposite to the inlet slit, and is open to the case of the meter. It is not, however, directly opposite to the inlet slit, but is so arranged that it remains sealed under water till the chamber is completely filled with gas, by which time the revolution of the cylinder has brought the inlet slit of the next chamber above the water, and it is ready to receive the gas. The filling of the next chamber carries round the one already filled, causes its descent into the water as it revolves, and completely expels the gas by the outlet slit. Two chambers only can be in action at one time. These chambers are made with great accuracy, and are liable to no variation but the enlargement caused by the evaporation of the water and the consequent depression of the water-line. On the front of the case of the meter is placed a box, into which the axis of the cylinder extends, having a spiral worm-wheel on its end. The worm-wheel communicates motion to an upright spindle, which again moves the train of wheels by which the handles of the index are worked. The front box also contains the filling and overflow pipes for the supply and adjustment of the water, the entrance-chamber by which the gas is admitted, and in which the float-valve is placed. This valve is supported and kept open by a float which descends, closes the valve, and shuts off the gas when the water is depressed too much.

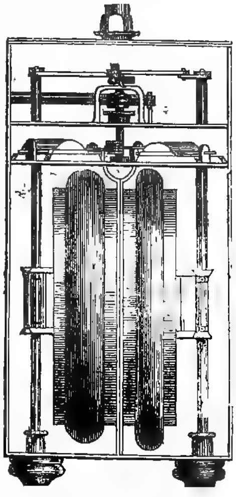


Wet Meter—side section.

An act of the British legislature has recently been passed, according to which all gasmeters must be so constructed as not to register more than 2 per cent. in favour of the seller, and 3 per cent. in favour of the purchaser of gas. Thus allowing 5 per cent. for variation caused by the depression of the water-line on wet gasmeters. All meters fixed since the act came into operation must bear the seal of an inspector appointed under the act. Previous to the passing of this act, wet gasmeters were made so that when the water-line was properly adjusted, they could not measure more than 2½ per cent. in favour of the seller, but they would register from 8 to 12 per cent. in favour of the purchaser before the water-line was sufficiently depressed to close the float-valve. In the arrangement adopted by Crosley, there was a defect which was unfortunately adhered to by many meter-makers in England, though it was abandoned by most of the makers in Scotland. This defect, known as 'the high spout,' arose from the pipe or spout which receives the gas in the front box, and conveys it into the cylinder, being made to project considerably above the water-line. This was intended to prevent the consumers of gas from being subjected to the inconvenience of their lights being rendered unsteady, or being extinguished by water coming over the edge of the spout and lodging in the bend which enters the cylinder; but if, in supplying water to the meter, the overflow-pipe which adjusts the water-line were closed, by the replacing of the plug before all the surplus water had run off, too much water would be contained in the meter, and its measuring capacity would consequently be restricted to the prejudice of the purchaser; and this having been ascertained to have occurred in various instances, much dissatisfaction was the natural result. The provisions of the act regulating measures used in sales of gas enforce the making of wet gasmeters with 'the low spout,' and consequently remove this objection entirely. Much skill and ingenuity have, since the passing of the act, been brought to bear on the construction and arrangement of wet gasmeters, in order to lessen, and, if possible, remove the risk of the float-valve closing more frequently than formerly, which it will be apt to do owing to the limitation of the descent of the water by the restriction of the variation of the measurement to 3 per cent. instead of from 8 to 12 per cent. against the seller.



Dry Meter—front view open.



Dry Meter—side view open.

The dry gasmeter possesses some advantages, which, were it in other respects equally esteemed with the wet meter, would give it the preference. Once adjusted, it gives no further trouble; it is not liable to derangement in frosty weather; and, in passing through it, the gas takes up no additional moisture to increase the risk of annoyance from deposit of water in the pipes. But doubts are entertained by many of the durability of the machine as an efficient and correct measure. The meter is made in various forms, and consists of chambers separated from each other by partitions; generally there are two, but some makers use three chambers. Each chamber is divided into two parts by a flexible partition which moves backwards and forwards, its motion being regulated by valves beautifully contrived for the purpose. The meter bears some resemblance to a double or triple steam-engine. Following out this resemblance, Mr Croll thus describes his meter: 'It consists of a cylinder divided by a plate in the centre, into two separate cylindrical compartments, which are closed at the opposite ends by metal discs; these metal discs serve the purpose of pistons, and they are kept in their places by a kind of universal-joint adapted to each; the space through which the discs move, and, consequently, the means of measurement, is governed by metal arms and rods, which space, when once adjusted, cannot vary. To avoid the friction attending a piston working in a cylinder, a band of leather is attached, which acts as a hinge, and folds with the motion of the disc; this band is not instrumental in the measuring, so that if it were to contract or expand, the registering of the meter would not be affected, inasmuch as it would only decrease or increase the capacity of the hinge, the disc still being at liberty to move through the required space; the leather is also distributed in such a manner, being curved, and bending only in one direction, that it prevents any wrinkles or creases forming, and renders it therefore much more durable. The arrangement of the valves and arms are somewhat different to that of a steam-engine, although similar in principle.'

Consumers of gas should bear in mind, that the purpose of the meter is to inform them how much gas they are expending; and that while the seller of gas cannot visit it but at long intervals, the purchaser may from day to day, if he pleases, ascertain the quantity which has passed through the meter, and so detect irregularity or waste, which, if allowed to go on, would no doubt be put down to error on the part of the seller of gas.

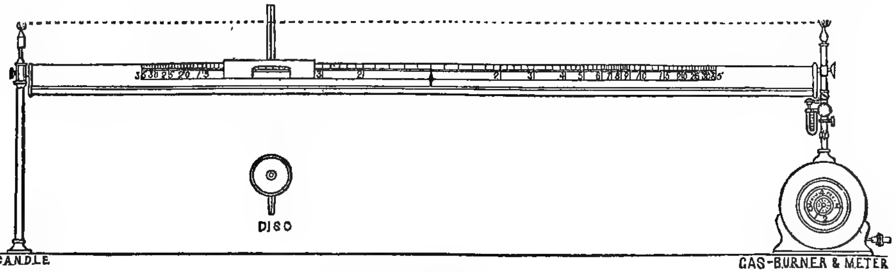
Gas-burners.—The burner made on the argand principle is still the best when carefully used, but it is expensive, somewhat troublesome to keep clean, and involves outlay for glasses from time to time. Jets and batwings have, consequently, almost supplanted it. These burners are now made by machinery at very low prices, so that to change them when out of order costs little, and is easily done. They are also very easily cleaned. Jets are of two kinds—cockspurs and union-jets. The cockspurs are pierced with one or more straight holes; the union-jets are pierced with two holes at an angle to each other, so that the streams of gas issuing from them impinge on each other, and produce a flat flame. Batwings are made with a clean slit across the head of the burner. Gas containing a great quantity of carbon requires burners with smaller apertures than gas containing little carbon, because when emitted too freely, the carbon does not come into contact with a sufficient quantity of oxygen, and the flame smokes: again, when the gas is emitted in too small a quantity, the flame becomes blue, and its illuminating power is diminished, because the carbon comes too rapidly into contact with oxygen. The light is emitted by the carbon when suspended for an instant in the flame in an incandescent state, and the flame which is capable of suspending the largest proportion of carbon in a state of incandescence, ultimately consuming the whole of it, will give the most powerful light from the smallest quantity of gas. Accordingly, an opaque yellowish flame, which is just at the smoking point, is more economical than a bluish-white flame for lighting purposes.

There are many contrivances for improved burners and improved modes of using gas. Of these it is enough to mention the sun-lights introduced by Mr King of Liverpool. These consist of a ring of union-jets, placed horizontally and set on the base of a cone which is passed through the ceiling, and conveys away the products of combustion through a flue, thus serving both for lighting and ventilating the apartments in which they are used.

Regulators.—The object of these instruments is to restrict the supply of gas when superabundant, and it should be noticed that the supply requires to be so before any advantage can result from the use of them. A conical valve, operating by the pressure of the gas in a manner similar to the governor at the gas-works, is in general the acting part of the apparatus.

The impurities which should be removed in the manufacture of coal-gas are sulphuretted hydrogen, ammonia, and carbonic acid. The presence of sulphuretted hydrogen is detected by allowing a stream of the gas to play on a paper wetted with a solution of acetate of lead, the test-paper is blackened if the deleterious gas be present. Ammonia is detected by allowing the gas to play on paper stained yellow with turmeric. Ammonia changes the yellow to brown. The presence of carbonic acid can be ascertained by causing the gas to bubble through lime-water. If carbonic acid be present, it combines with the lime, and the water becomes milky.

The value of gas for lighting depends on its illuminating power, which again mainly depends on the proportion of olefiant gas and heavy hydrocarbons contained in the mixture. The specific gravity of the gas would be a complete test of the illuminating power, were it first ascertained that no deleterious gases were contained in the mixture. The chlorine and bromine tests, which are applied by bringing the gas into contact with either of these substances in a graduated tube, also require that the absence of deleterious gases be ascertained. Chlorine and bromine condense the olefiant gas and heavy hydrocarbons, and the proportion of them present is ascertained by the proportion of the gas which is condensed.



Gas-photometer.

The most practical mode of determining the illuminating power is by the use of the Bunsen photometer, introduced into this country by Dr Lyon Playfair, and adapted by Mr King of Liverpool. At one end of a straight bar of wood, a gas-burner is mounted; on the other end, a candlestick. These are so placed, that when lighted, there are exactly 100 inches between the centres of the lights.

The bar is correctly graduated to shew how many times the one light exceeds the other. A circular disc of paper made semi-transparent, excepting a spot in the centre, which is left opaque, is placed at right angles across the graduated bar on a stand which slides along the bar. When the disc is moved into a position where the opaque spot is invisible, the lights are equal—the disappearance of the spot being caused by the light transmitted by the semi-transparent part of the disc being equal to that reflected by the opaque part. The figures immediately below the disc indicate the power of the light. It is usual to compare a burner consuming five feet per hour with a sperm candle consuming 120 grains per hour, and when the quantities consumed during an experiment are not exactly in these proportions, the results are rectified by calculation.

As has been stated, the illuminating power of coal-gas may vary from ten sperm candles up to nearly forty, though it is more than probable that either extreme is unknown to consumers; the cost of production, however, does not vary in the same ratio with the value of the gas, it being affected by totally independent causes, and these causes are so various, that the cost can hardly be the same in any two places. Another difficulty in contrasting the price of gas in different places, arises from the unavoidable variation in the quantity accounted for, the loss sustained under the head of condensation, leakage, bad debts, and waste, varies from 10 up to 30 per cent. on the whole quantity made; and though when this loss is excessive, the remedy should, to a certain extent, be in the power of the manufacturer, yet there is a considerable range within which the loss may vary owing to local and peculiar circumstances which the manufacturer cannot control. The price of gas being dependent on the cost of production and distribution, rather than on the illuminating power, and the changes in the former being less than the variations in the latter, gases of high illuminating power are more economical than gases of low illuminating power.

The economy of gas for lighting purposes will be apparent when it is considered that 50 feet of gas, consumed in a burner at 5 feet per hour, will last 10 hours; while a sperm candle of six to the pound, and burning 120 grains per hour, will only last 9·722 hours. Assuming, however, that both will last 10 hours—a view which is in favour of the candle—1000 cubic feet will last as long as 20 candles; therefore, with an illuminating power of 15 candles, it will give an amount of light equal to 300 candles, or 50 lbs., which at 2*s.* per pound would cost £5; at 20 candles it would equal 400, or 66⅔ lbs., costing £6, 13*s.* 4*d.*; at 25 candles it would equal 500, or 83⅓ lbs., costing £8, 6*s.* 8*d.*; at 30 candles, it would equal 600, or 100 lbs., costing £10.

Mr Rutter, author of a useful pamphlet titled *Advantages of Gas in Private Houses* (Parker and Son, West Strand), gives the following table, the experiments from which it is deduced having apparently been made with 12 or 14 candle-gas at 6*s.* per 1000 feet.

COMPARATIVE COST OF LIGHT FROM CANDLES, LAMPS, AND GAS.

	Quantities and Prices of Candles and Oil.			Quantities and Cost of Gas.		
				Cub. feet.	6*s.* per 1000.	
		s.	*d.*		*s.*	*d.*
Tallow Candles (dips), .	1 lb.	0	7	21	0	1½
" " (moulds), .	1 lb.	0	9	21	0	1½
Composite Candles, . .	1 lb.	0	10	25	0	1¾
Wax " . . .	1 lb.	2	4	25	0	1¾
Common Lamp Oil, . .	1 gall.	5	6	175	1	0⅗
Sperm Oil, ...	1 gall.	10	0	217	1	3⅗

It must be remarked, that the above prices are for equal quantities of light, which, however, is not the measure of economy, just because no one is contented to take no more light from gas than from other modes of lighting; and second, because the gas-lights being fixed, more light is requisite in order to compensate the loss of the convenience afforded by a movable light. Five feet per hour of 15 candle-gas will fully supply the place of a pair of sperm candles, costing 8*d.* for 10 hours' light; while the gas at 5*s.* per 1000 feet would only cost 3*d.* for the same time, and would yield a light 7½ times as great.

The use of gas for heating and cooking is becoming extensive. Its great recommendations are facility of regulation, readiness of application, and perfect cleanliness. In roasting by gas, the juices are retained in the meat to a greater extent than by the ordinary process; while in all the operations, the heat can be regulated with so much nicety, as greatly to aid the cook in presenting the food in the most wholesome and agreeable condition.

Besides brilliancy of light, safety and cleanliness attend the use of gas. Explosions under ordinary circumstances are hardly possible—the escape of gas is quite disagreeably perceptible by the smell when there is one three-thousandth part present in the atmosphere; and there can be no explosion unless with, at the least, 200 times that quantity, or 1 part in 15. Such accumulations will, and do undoubtedly, take place in confined situations, but ordinary precaution in avoiding the use of a light will avert the risk of accident. Gas, having a tendency to ascend, escapes near the ceiling of an apartment are more likely to form an explosive mixture than escapes occurring low down. Repeated accidents have happened through forgetfulness of this. It should be remembered that the situation must be considered a confined one when the gas is prevented from ascending freely. The standard work on gas-lighting is that by the late Samuel Clegg, Jun., son of the inventor of the gasmeter, published by John Weale, London. There is also a smaller work by the same publisher, written by Samuel Hughes, C.E.

GASCOIGNE, SIR WILLIAM, an eminent English judge, belonging to a noble Norman family, was born at Gaythorpe, Yorkshire, in 1350. After studying for the bar, he acquired considerable reputation as a pleader, and in 1398 was made serjeant-at-law. On the accession of Henry IV. in 1399, he was appointed one of the justices of the Court of Common Pleas; and in 1401, was promoted to be chief-justice of the King's Bench. In this high office he distinguished himself both by integrity and ability, and in the older English law reports are many abstracts of his opinions, arguments, and decisions. In July 1403, he was joined with the Earl of Westmoreland in a commission for levying forces against the insurrection of Henry Percy, the celebrated Hotspur. He was also nominated one of the commissioners to treat with the rebels. On this and another memorable occasion, he acted with a courage and rectitude which evinced that he was guided by the true spirit of judicial independence. On the apprehension of Scroop, archbishop of York, he refused, at the command of the king, to sentence that prelate to death as a traitor, because the law gave him no jurisdiction over the life of an ecclesiastic. Henry respected his uprightness, and knighted him the same year. When one of the dissolute associates of the Prince of Wales was arraigned before him for felony, the prince imperiously demanded his release, and on being ordered to leave the court, he rushed furiously up to the bench, and, it is recorded, struck the chief-justice on the judgment-seat. G. immediately committed him to prison, when the prince, sensible of his misconduct, at once submitted. On being informed of the circumstance, the king thanked God for having given him 'both a judge who knew how to administer the laws, and a son who respected their authority.' G. was called to the first parliament of Henry V., but died the same year, December 17, 1413. He was twice married, and left numerous descendants by both his wives.

GASCON, GASCONNADE. The term *Gascon* is now employed, in the French language, to denote a boaster or braggart, and *Gasconnade* to signify any extravagant or absurd vaunting—the inhabitants of the district once known as Gascony having long been notorious in this respect. An example may be given: a Gascon, on a visit to Paris, was asked by his city-friend what he thought of the colonnade of the Louvre. His reply was: 'Ah, it's not bad; it resembles pretty closely the back part of the stables at my father's castle!' There are in French, volumes filled with the original sallies of these humorous boasters.

GA'SCONADE, a river of North America, rises in the south of the state of Missouri, and, after flowing north-east for 250 miles, joins the river Missouri about 40 miles below Jefferson City. It flows through a hilly country, covered with forests of pine and other timber, and rich in picturesque scenery. Great rafts of yellow pine lumber are floated down the river annually.

GA'SCONY (Lat. *Vasconia*), formerly a district in the south-west of France, was situated between the Bay of Biscay, the River Garonne, and the Western Pyrenees, and is now included in the departments of Landes, Gers, Hautes Pyrénées, and the southern portions of Haute Garonne, Tarn-et-Garonne, and Lot-et-Garonne. It derived its name from the Basques or Vasques, who, driven by the Visigoths from their own territories on the southern slope of the Western Pyrénées, crossed to the northern side of that mountain-range in the middle of the 6th c., and settled in the former Roman district of Novempopulana. In 602, after an obstinate resistance, the Vasques were forced to submit to the Franks. They now passed under the sovereignty of the Dukes of Aquitania, who for a time were independent of the crown, but were afterwards conquered by King Pepin, and later by Charlemagne. Subsequently it became incorporated with Aquitania (q. v.).

GASES, General Properties of. The term gas—which is probably derived from the German word *Geist*, spirit—was employed by the older chemists to designate any kind of air or vapour. Macquer (q. v.) was the first chemist who limited the term gas to such elastic fluids as had not been rendered liquid or solid by a reduction of temperature. The only substances that gases are liable to be confounded with are vapours; but there is this essential difference between them, that the former are invariably aëriform at ordinary temperatures and atmospheric pressures, while the latter under these conditions are solid or liquid, and only assume a vaporous or apparently gaseous form at relatively high temperatures. Thus oxygen, hydrogen, nitrogen, chlorine, &c., are true gases; while water, sulphur, iodine, &c., when heated to certain definite points, become transformed into vapours.

Their perfect elasticity is one of the most important physical peculiarities of gases. Within the limits of all ordinary experiments it is generally true that 'the volume of a gaseous body is inversely as the compressing force.' See Mariotte's Law.

In consequence of their extreme elasticity, gases exhibit an entire absence of cohesion among their particles, and in this respect they differ essentially from liquids. A vessel may be filled either partially or completely with a liquid, and this liquid will have a definite level surface or limit. With gases, it is otherwise; they always perfectly fill the vessel that contains them, however irregular its form. Instead of cohesion, there is a mutual repulsion among their particles, which have a continual tendency to recede further from each other, and thus exert a pressure in an outward direction upon the sides of the vessel in which the gas is enclosed. This outward pressure is greater or less according as the elasticity of the gas is increased or diminished. Experimental proofs of the facts mentioned in this and the preceding paragraph may be found in Miller's *Chemical Physics*, in the first volume of Jamin's *Cours de Physique*, or in any standard work on Physics.

Dalton long ago remarked that 'there can scarcely be a doubt entertained respecting the reducibility of all elastic fluids, of whatever kind, into liquids; and we ought not to despair of effecting it at low temperatures and by strong pressure exerted upon the unmixed gases.' Various chemists, amongst whom we must especially mention Faraday, have accomplished all that Dalton foretold, and various gases can now be exhibited not only in the liquid but in the solid form. It occurred to Faraday, who has led the van in these investigations, that the most probable mode of obtaining gases (or rather what, under ordinary circumstances, would be gases) in the liquid state, would be to generate them under strong pressure. When thus produced in strong bent glass tubes, they continued liquid at low temperatures while the pressure was maintained; but on removing the pressure (breaking the tube), they instantly passed into the gaseous state. In his Memoir, published in the *Philosophical Transactions* for 1823, he announces that he has succeeded in liquefying chlorine, euchlorine (a yellow explosive gas discovered by Davy, and consisting of a mixture of chlorine and chloro-chloric acid), sulphuretted hydrogen, nitrous oxide, cyanogen, ammonia, and hydrochloric, sulphurous and carbonic acids. Since that time, by the joint action of powerful mechanical pressure (sometimes upwards of 50 atmospheres), and extreme cold, the number of liquefiable gases has been so far extended as to include all except oxygen, hydrogen, nitrogen, nitric oxide, and coal-gas; and the following gases have been obtained in a solid form—hydriodic acid, hydrobromic acid, sulphurous acid, sulphuretted hydrogen, carbonic acid, cyanogen, ammonia, euchlorine, fluoride of silicon. The ammonia and sulphuretted hydrogen, when solidified, each furnished a white translucent mass, like fused nitrate of ammonia; euchlorine gave a transparent orange-coloured crystalline solid; while the other liquefied gases that were susceptible of solidification by the application of intense cold, furnished colourless transparent crystalline masses like ice.

'Oxygen remained gaseous under a pressure of 27 atmospheres at a temperature of – 166°, and a pressure of 58·5 atmospheres at – 140° was equally ineffectual in producing its liquefaction. Nitrogen and binoxide of nitrogen resisted a pressure of 50 atmospheres; with carbonic oxide, a pressure equivalent to that of 40 atmospheres, with coal-gas, one of 32, and with hydrogen, one of 27 atmospheres was applied without effecting the liquefaction. In all these experiments, the temperature was maintained at – 166°. Owing to the superior diffusiveness of the lighter gases, such as hydrogen, the apparatus began to leak at comparatively low pressures, and thus a limit was placed to the amount of pressure that could be applied to them.'

As a point of historical interest, we may mention that many years before the publication of Faraday's earliest researches on this subject, sulphurous acid gas had been liquefied by Monge and Clouet, ammonia by Guyton Morveau, and arseniuretted hydrogen by Stromeyer, by the simple application of cold, without any increased pressure.

The expansion and contraction of gases by changes of temperature is treated of under HEAT.

The process of intermixture in gases, and the movements of these substances generally, have been very carefully studied by Faraday, Döbereiner, Mitchell, Bunsen, and especially Graham. These movements are usually considered under four heads, viz.: 1. *Diffusion*, or the intermixture of one gas with another; 2. *Effusion*, or the escape of a gas through a minute aperture in a thin plate into a vacuum; 3. *Transpiration*, or the passage of different gases through long capillary tubes into a rarefied atmosphere; 4. *Osmosis*, or the passage of gases through diaphragms.

In the article *Diffusion* (q. v.), the general principles of this kind of movement in gases are sufficiently explained, and we shall merely make one or two supplementary remarks, chiefly with the view of rendering the following table more intelligible. Graham's experiments with the simple diffusion-tube shew (see Graham's Memoirs in the *Transactions of the Royal Societies of London and Edinburgh*, or Miller's *Chemical Physics*) that the diffusiveness or *diffusion volume* of a gas is in the inverse ratio of the square root of its density; consequently, the squares of the times of equal diffusion of the different gases are in the ratio of their specific gravities. Thus, the density of air being taken as the standard of comparison at 1, the square root of that density is 1, and its diffusion volume is also 1; the density of hydrogen is 0·0692, the square root of that density is 0·2632, and its diffusion volume is $\frac{1}{0\cdot2632}$, or 3·7994; or, as actual experiment shews, 3·83—that is to say, if hydrogen and common air be placed under circumstances favouring their mutual diffusion, 3·83 volumes of hydrogen will change place with 1·00 of air. The following table gives: 1. The density; 2. The square root of the density; 3. The calculated, and 4. The observed velocity of diffusion or diffusiveness of several important gases; the numbers in the last column, headed 'Rate of Effusion,' being the results obtained by experiment upon the rapidity with which the different gases escape into a vacuum through a minute aperture about $\frac{1}{300}$ of an inch in diameter.

Gas.	Density.	Square Root of Density.	Calculated Velocity of Diffusion.	Observed Velocity of Diffusion. Air = 1.	Rate of Effusion.
Hydrogen, ...	0·06926	0·2632	3·7994	3·83	3·613
Light Carburetted Hydrogen,	0·559	0·7476	1·3375	1·344	1·322
Carbonic Oxide, . .	0·9678	0·9837	1·0165	1·0149	1·0123
Nitrogen, ...	0·9713	0·9859	1·0147	1·0143	1·0164
Olefiant Gas, . .	0·978	0·9889	1·0112	1·0191	1·0128
Binoxide of Nitrogen, .	1·039	1·0196	0·9808		
Oxygen, ...	1·1056	1·0515	0·9510	0·9487	0·950
Sulphuretted Hydrogen, .	1·1912	1·0914	0·9162	0·95	
Protoxide of Nitrogen, .	1·527	1·2357	0·8092	0·82	0·834
Carbonic Acid, . . .	1·52901	1·2365	0·8087	0·812	0·821
Sulphurous Acid, . .	2·247	1·4991	0·6671	0·68	

'The process of diffusion,' says Professor Miller, 'is one which is continually performing an important part in the atmosphere around us. Accumulations of gases which are unfit for the support of animal and vegetable life are by its means silently and speedily dispersed, and this process thereby contributes largely to maintain that uniformity in the composition of the aërial ocean which is so essential to the comfort and health of the animal creation. Respiration itself, but for the process of diffusion, would fail of its appointed end, in rapidly renewing to the lungs a fresh supply of air, in place of that which has been rendered unfit for the support of life by the chemical changes which it has undergone.'

A reference to the last two columns of the above table shews that, within the limits of experimental errors, the rate of effusion of each gas coincides with its rate of diffusion.

Graham's experiments shew that the velocity of *transpiration* (the term which that chemist applied to the passage of gas through long capillary tubes) is entirely independent of the rate of diffusion, or of any other known property. It varies with the chemical nature of the gas, and is most probably 'the resultant of a kind of elasticity depending upon the absolute quantity of heat, latent as well as sensible, which different gases contain under the same volume; and therefore will be found to be connected more immediately with the specific heat than with any other property of gases.' Oxygen is found to have the lowest rate of transpiration. Taking its transpiration velocity at 1, that of air is 1·1074; of nitrogen, 1·141; of carbonic acid, 1·369; of sulphuretted hydrogen, 1·614; of ammonia, 1·935; of olefiant gas, 1·980; and of hydrogen, 2·288.

In the passage of gases through diaphragms, the law of the diffusion of gases is more or less disturbed or modified according to the force of adhesion in the material of which the diaphragm is composed; the disturbance being greatest in the case of soluble gases and a moist thin diaphragm, such as a bladder or a rabbit's stomach. For details on this subject we must, however, refer to the article OSMOSIS.

All gases are more or less soluble in water and other liquids. Some gases, as, for example, hydrochloric acid and ammonia, are absorbed by water very rapidly, and to a great extent, the liquid taking up 400 or 600 times its bulk of the gas; in other cases, as carbonic acid, water takes up its own volume of the gas; whilst in the case of nitrogen, oxygen, and hydrogen, it does not take up more than from $\frac{1}{25}$ to $\frac{1}{50}$ of its bulk. 'As the elasticity of the gas,' says Professor Miller, 'is the power which is here opposed to adhesion, and which at length limits the quantity dissolved, it is found that the solubility of each gas is greater, the lower the temperature, and the greater the pressure exerted upon the surface of the liquid. Dr Henry found that at any given temperature the *volume* of any gas which was absorbed was uniform, whatever might be the pressure; consequently, that the *weight* of any given gas absorbed by a given volume of any liquid at a fixed temperature, increased directly with the pressure. If the pressure be uniform, the quantity of any given gas absorbed by a given liquid is also uniform for each temperature; and the numerical expression of the solubility of each gas in such liquids, is termed its *coefficient of absorption* or *of solubility*, at the particular temperature and pressure, the volume of the gas absorbed being in all cases calculated for 32° F., under a pressure of 29·92 inches of mercury. Thus, 1 volume of water at 32°, and under a pressure of 29·92 inches of the barometer, dissolves 0·04114 of its volume of oxygen; and this fraction represents the coefficient of absorption of oxygen at that temperature and pressure. Similarly, the coefficient of absorption of common air is 0·02471. In consequence of this solubility of the air, all water contains a certain small proportion of it in solution; and if placed in a vessel under the air-pump, so as to remove the atmospheric pressure from its surface, the dissolved gases rise in minute bubbles. Small as is the quantity of oxygen thus taken up by water from the atmosphere, it is the means of maintaining the life of all aquatic animals. If the air be expelled from water by boiling, and it be covered with a layer of oil, to prevent it from again absorbing air, fish or any aquatic animals placed in such water quickly perish. Even the life of the superior animals is dependent upon the solubility of oxygen in the fluid which moistens the air-tubes of the lungs, in consequence of which this gas is absorbed into the mass of the blood, and circulates through the pulmonary vessels.'

The following table, drawn up from the researches of Bunsen and Carius, shews the solubility of some of the most important gases, both in water and alcohol:

Gas.	Volume of each Gas dissolved in 1 Volume of Water.		Volume of each Gas dissolved in 1 Volume of Alcohol.	
	At 32 Degrees F.	At 59 Degrees F.	At 32 Degrees F.	At 59 Degrees F.
Ammonia,	1049·60	727·2		
Hydrochloric Acid,	505·9	458·0		
Sulphurous Acid,	68·861	43·564	328·62	144·55
Sulphuretted Hydrogen,	4·3706	3·2326	17·181	9·539
Chlorine,	Solid	2·368		
Carbonic Acid,	1·7967	1·002	4·3295	3·1993
Protoxide of Nitrogen,	1·3052	0·0778	4·1780	3·2678
Olefiant Gas,	0·2563	0·1615	3·5950	2·8825
Binoxide of Nitrogen,			0·31606	0·27478
Marsh Gas,	0·05449	0·03909	0·52259	0·48280
Carbonic Oxide,	0·03287	0·02432	0·20443	0·20443
Oxygen,	0·04114	0·02989	0·28397	0·28397
Nitrogen,	0·02035	0·01478	0·12634	0·12142
Air,	0·02471	0·01795		
Hydrogen,	0·01930	0·01930	0·06925	0·06725

All these gases, with the exception of hydrochloric acid, may be expelled from the water by long-continued boiling.

Gases are not absorbed by all liquids in the same order; for example, naphtha absorbs most olefiant gas, oil of lavender most protoxide of nitrogen, olive oil most carbonic acid, and solution of chloride of potassium most carbonic oxide.

If a mixture of two or more gases be agitated with water, or probably any other liquid, a portion of each gas will be absorbed, and the amount of each so absorbed or dissolved will be proportional to the relative volume of each gas multiplied with its coefficient of solubility at the observed temperature and pressure. As all ordinary liquids exert a greater or less solvent action on gases, a gas that we wish to examine quantitatively should be collected over mercury.

The adhesion of gases to solids next requires notice. Illustrations of this phenomenon perpetually occur. Thus, wood and other solid substances immersed in water or other liquids appear covered with air-bubbles. It is this adhesion of air to the surface of glass tubes which causes the difficulty of obtaining barometers and thermometers completely free from air. It is in consequence of the adhesion of air to their surfaces that many small insects are enabled to skim lightly over the surface of water which does not wet them. A simple method of illustrating this phenomenon is by gently dusting iron filings over the surface of a vessel of water; if we proceed carefully, a considerable mass of the iron may accumulate upon the surface; till, at last, it falls in large flakes, carrying down with it numerous bubbles of air. As the particles of iron are nearly eight times as heavy as water, it was only the adherent air that enabled them to float upon the surface. Closely allied to this adhesion is the remarkable property of condensation which porous bodies, and especially charcoal, exert on gases. Owing to this property of charcoal—especially freshly burned vegetable charcoal—various gases may be separated from their watery solution by filtration of the latter through it; for example, sulphuretted hydrogen may be removed from water so completely that it cannot be detected either by its well-known odour or by the ordinary tests. Saussure found that 1 volume of freshly burned box-wood charcoal absorbed 90 volumes of ammonia, 85 of hydrochloric acid, 65 of sulphurous acid, 55 of sulphuretted hydrogen, 40 of protoxide of nitrogen, 35 of carbonic acid, 35 of bi-carburetted hydrogen, 9·4 of carbonic oxide, 9·2 of oxygen, 7·5 of nitrogen, 5·0 of carburetted hydrogen, and 1·7 of hydrogen. These results follow an order very nearly the same as that of the solubility of the gases in water.

Stenhouse has investigated the differences in the absorbent power of different kinds of charcoal; the following are his most important results: 0·5 of a gramme of each kind of charcoal being employed, and the numbers in the table indicating in cubic centimetres the quantity of absorbed gas.

Gas Used.	Kind of Charcoal employed.		
	Wood.	Peat.	Animal.
Ammonia,	98·5	96·0	43·5
Hydrochloric Acid,	45·0	60·0	
Sulphurous Acid,	32·5	27·5	17·5
Sulphuretted Hydrogen,	30·0	28·5	9·0
Carbonic Acid,	14·0	10·0	5·0
Oxygen,	0·8	0·6	0·5

So rapid is this action of charcoal, that Stenhouse has proposed to use a respirator filled with it to protect the mouth and nostrils in an infected atmosphere; and the employment of trays of powdered wood-charcoal in dissecting-rooms, in the wards of hospitals, and in situations where putrescent animal matter is present, is found to act very beneficially in purifying the air by absorbing the offensive gases. Its use in reference to the filtration of water has been already alluded to.

The determination of the exact specific gravity of the different gases is of great importance in calculating the proportions of the different ingredients of compounds into which they enter; and the whole series of numbers expressing the chemical equivalents or atomic weights of bodies depend upon the accuracy of the determination of the specific gravity of hydrogen and oxygen.

The following table gives the specific gravity and the weight of 100 cubic inches of some of the most important gases at a barometric pressure of 30 inches, and at a temperature of 60°, together with the name of the observer:

Gas.	Specific Gravity. Air = 1.	Weight of 100 Cubic Inches in Grains.	Observer.
Air, ...	1·0000	30·935	Regnault.
Oxygen, ...	1·1056	34·203	"
Nitrogen, ...	0·9713	30·119	"
Hydrogen, ...	0·0692	2·143	"
Carbonic Acid, .	1·5290	47·303	"
Chlorine, ...	2·5000	76·250	Thomson.
Ammonia, ...	0·5902	18·003	"
Carburetted Hydrogen,	0·5555	16·944	"
Olefiant Gas, ...	0·9722	29·652	"
Arseniuretted Hydrogen,	0·5290	16·130	Tromsdorff.
Sulphuretted Hydrogen,	1·1805	36·007	Thomson.
Cyanogen, . .	1·8055	55·069	Gay Lussac.
Hydrochloric Acid, .	1·2847	39·183	Thomson.
Sulphurous Acid, . .	2·2222	67·777	"

The methods employed for determining the specific gravity of a gas, both by direct observation and by calculation, will be noticed in the article Specific Gravity.

As to the chemical properties of gases, most of the different gases, when pure, can be readily distinguished by some well-marked physical or chemical property. Some are distinguished by their colour, others by their peculiar odour; but several of the most important ones—viz., oxygen, nitrogen, hydrogen, carbonic acid, carbonic oxide, light carburetted hydrogen, olefiant gas, and protoxide of nitrogen—require other means for their discrimination. The distinctive characters of the most important gases are noticed in the articles Oxygen, Hydrogen, Chlorine, &c., and the outlines of the general method of analysing a gaseous mixture are given in a separate article. For further details on the physical and chemical characters of the gases, we must refer to Miller's *Elements of Chemistry*, and especially to the volume on *Chemical Physics*, from which we have borrowed freely; to Kekule's *Lehrbuch der Organischen Chemie*, 1859; and to Roscoe's translation of Bunsen's *Gasometry*.

GASKELL, Mrs Elizabeth C., an English authoress, was born about the year 1820, and is the wife of a Unitarian clergyman in Manchester. Her maiden name was Stevenson. Her novels, of which *Mary Barton* (1848) and *Ruth* (1853) are perhaps the best examples, are chiefly descriptive of the habits, thoughts, privations, and struggles of the industrial poor, as these are to be found in such a social beehive as the city in which the authoress resides. Some of her characters are drawn with remarkable dramatic power, and many of her descriptive passages are very graphic. Among her other works may be mentioned *The Moorland Cottage* (1850), a Christmas story; *North and South* (1855); *Cranford;* and *Lizzie Leigh*—the last three of which originally appeared in *Household Words*. Mrs G. has edited a very interesting life of Charlotte Bronte (q. v.), 1857. Her last work, *Round the Sofa*, appeared in 1859.

GASOMETER. See Gas.

GASPÉ, the most easterly district of Lower Canada, consisting of the counties of Gaspe and Bonaventure, is chiefly a peninsula projecting into the Gulf of St Lawrence, between the estuary of the same name on the north and the Bay of Chaleur on the south. It stretches in N. lat. between 48° and 49° 20′, and in W. long. between 64° 15′ and 67° 56′, containing 7500 square miles, and about 12,000 inhabitants, the greater number being of French descent. Cod and whale fisheries form the staple business of the country. The district is terminated towards the east by a cape of its own name, and this headland is the northern extremity of a bay also of the same name, which presents a safe and capacious harbour.

GASSENDI, or **GASSEND**, Pierre, an eminent French philosopher and mathematician, was born 22d January 1592, at Champtercier, a little village of Provence, in the department of the Lower Alps. His unusual powers of mind shewed themselves at an early age; and in 1616 he became professor of theology at Aix. About this time, he drew upon himself the regards of Pieresc, whom Bayle calls the *procureur-general* of literature, and of Joseph Gautier, prior of La Valette, a distinguished mathematician, both of whom liberally gave him the benefit of their instructions and advice. With the first, he studied anatomy; from the second, he derived his taste for astronomical observations. After six years' study, he became disgusted with the scholastic philosophy, and undertook to maintain certain theses against the Aristotelians. His polemic appeared at Grenoble in 1624, and was entitled *Exercitationes paradoxicæ adversus Aristoteleos.* It was accompanied by an expression of his belief in the church, for whose honour and glory he declared himself 'ready to shed the last drop of his blood.' He drew a distinction for the first time between the church and the scholastic philosophy, denying that the former must stand or fall by the latter. G. now visited Paris, where he made several influential friends. In the same year in which he published his *Exercitationes*, he was appointed *prevôt* of the cathedral at Digne, an office which enabled him to pursue without distraction his astronomical and philosophical studies. In 1628 he travelled in Holland, and got involved in a controversy with Robert Fludd, an English mystic, relative to the Mosaic cosmogony, in which he is admitted to have had greatly the advantage of his incoherent opponent. At the recommendation of the Archbishop of Lyon, a brother of Cardinal Richelieu, G. was appointed professor of mathematics in the College Royal de France, at Paris, where he died, 14th October 1655. As a philosopher, G. maintained, with great learning and ingenuity, most, though not all, of the doctrines of Epicurus, these being most easily brought into harmony with his own scientific acquirements and modes of thought. His philosophy was in such repute, that the savans of that time were divided into Cartesians and Gassendists. The two chiefs themselves always entertained the highest respect for each other, and were at one time on the friendliest terms. The agreeableness of their intercourse, however, was for a while interrupted by the publication of a work of G.'s, entitled *Dubitationes ad Meditationes Cartesii*, in which he expressed himself dissatisfied with the tendencies of the new system of philosophy introduced by Descartes, for G. was averse to novelty in the sphere of mental speculation, although he warmly espoused the side of progress in physical science, and made himself many enemies among his bigoted ecclesiastical brethren for the love he bore it. He ranked Kepler and Galileo among his friends, and was himself the instructor of Molière. His principal work is entitled *De vita, moribus et doctrina Epicuri* (Lyon, 1647), to which the *Syntagma Philosophiæ Epicureæ* (1649) belongs. It contains a complete view of the system of Epicurus. His *Institutio Astronomica* (1645) is a clear and connected representation of the state of the science in his own day; in his *Tychonis Brahœi, Nicolai Copernici, Georgii Peurbachii et Joannis Regeomontani Astronomorum Celebrium Vitæ* (Par. 1654), he not only gives a masterly account of the lives of these men, but likewise a complete history of astronomy down to his own time. G. was pronounced by Bayle the greatest philosopher among scholars, and the greatest scholar among philosophers. His works were collected and published by Montmor and Sorbière (Lyon, 6 vols. 1658).

GASSNER, JOHANN JOSEPH, a man who made a noise as an exorcist in the 18th c., was born 28th August 1727, at Bratz, near Pludenz, in the Tyrol, and became Catholic priest at Klösterle, in the diocese of Coire. While in that office, the accounts of demoniacs in the New Testament, combined with the writings of celebrated magicians, brought him to the conviction that most diseases are attributable to evil spirits, whose power can be destroyed only by conjuration and prayer. He began to carry out his conviction by practising on some of his parishioners, and succeeded so far as to attract notice at least. The Bishop of Constance called him to his residence, but having come very soon to the conviction that he was a charlatan, advised him to return to his parsonage. G. betook himself, however, to other prelates of the empire, some of whom believed that his cures were miraculous. In 1774, he even received a call from the bishop at Ratisbon, to Ellwangen, where, by the mere word of command, *Cesset* (Give over), he cured persons who pretended to be lame or blind, but especially those afflicted with convulsions and epilepsy, who were all supposed to be possessed by the devil. Although an official person kept a continued record of his cures, in which the most extraordinary things were testified, yet it was found only too soon that G. very often made persons in health play the part of those in sickness, and that his cures of real sufferers were successful only so long as their imagination remained heated by the persuasions of the conjuror. Intelligent men raised their voice against him, and he lost all respect before his death. He died, March 1779, in possession of the wealthy deanery of Benndorf.

GAS-TAR, or **COAL-TAR**, a thick, black, opaque liquid, which comes over and condenses in the pipes when gas is distilled from coal. It is slightly heavier than water, and has a strong, disagreeable odour. Coal-tar is a mixture of many distinct liquid and solid substances, and the separation of the more useful of these constitutes an important branch of manufacturing chemistry. The tar is first distilled in large malleable iron stills, when *water* and *crude naphtha* first come over; and afterwards, when the temperature rises, a heavy, fetid-smelling oil, called *dead-oil*, which sinks in water. There remains in the still a large residue of *pitch*, which is again distilled in brick ovens, giving off an oil called *coke-oil*, and leaving a large quantity of *pitch-coke*. The crude naphtha is purified by sulphuric acid and quicklime, and re-distilled, when it is nearly as colourless as water. This, then, forms the refined coal-tar naphtha of commerce. It is largely used for burning in lamps, as a solvent for india-rubber and gutta-percha, to preserve animal substances from moth, and it is also burned to produce a fine carbon for the manufacture of printing-ink. It is from the lighter portion of naphtha, called *benzole*, that the beautiful mauve and magenta colours are manufactured. See BENZOLE and DYE-STUFFS. Benzole is likewise used for removing stains of fat or oil from cloth. The dead-oil or pitch-oil is sometimes used, in its crude state, as a cheap material for affording light in lamps burned in the open air. It contains a considerable quantity of creasote, and forms the best preservative for wood in damp situations. The coke-oil is not of much commercial importance, but it can be burned in lamps, and this, with the dead-oil, when consumed in a confined atmosphere, gives a smoky flame, the soot from which constitutes lampblack. The pitch-coke is valuable as a fuel for melting iron, being free from impurities. Pitch itself is used for making asphalt pavement, and also for roofing-felt.

From the last portion of the distillation of the crude naphtha, and the first of the dead-oil, a beautiful white crystalline solid, called naphthaline, is obtained. It has been long known without being applied to any useful purpose, but is now beginning to be employed for the manufacture of colours, in a similar way to the benzole. The dead-oil also contains considerable quantities of a yellow solid termed paranaphthaline, which is a mere chemical curiosity.

The creasote is extracted from the dead-oil by stirring it with soda, in which the creasote dissolves. When this soda solution is boiled for some hours, and then has an acid added to it, the creasote separates as an oil on the surface of the fluid, and, when distilled, is nearly pure. This treatment requires to be repeated several times to get it quite pure, and to keep its colour. Most of the creasote used by druggists is made from coal-tar. The creasote from wood is a similar but quite distinct body.

Sulphuric acid extracts both from the dead-oil and the crude naphtha several volatile basic oils besides benzole—namely, toluole, xylole, cumole, and cymole, which are almost unknown in the arts, although they may yet come to be of great service. Among them is aniline, but not in sufficient quantity to pay for its extraction. There also occurs a curious body named pyrrol, the vapour of which gives to fir-wood, dipped in muriatic acid, a splendid violet colour. Beautiful blue colours have been made from these basic oils, but only by elaborate and expensive processes.

GASTERO'PODA (Gr. belly-footed), or **GASTROPODS**, a class of molluscs, inferior in organisation to cephalopods, but far superior to almost all other molluscs, and containing a multitude of species, the greater number of which are marine, but some are inhabitants of fresh water, and some are terrestrial. Snails, whelks, periwinkles, limpets, cowries, and the greater number of molluscs with univalve shells belong to this class, and univalve molluscs constitute the greater part of it; but it contains also some molluscs with multivalve shells, as chitons, and some, as slugs, which have either only a rudimental internal shell, or no shell at all. Some aquatic kinds are destitute of shell in the adult state, but they are protected by a rudimentary shell on first issuing from the egg. No known gastropod has a bivalve shell, unless the *operculum*, which closed the mouth of the shell in many species, be regarded as a second valve.

Gastropods have a head, more or less fully developed, in which is situated the mouth, and

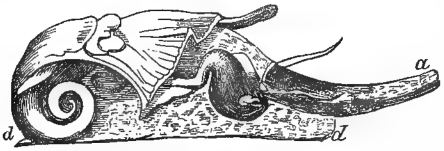
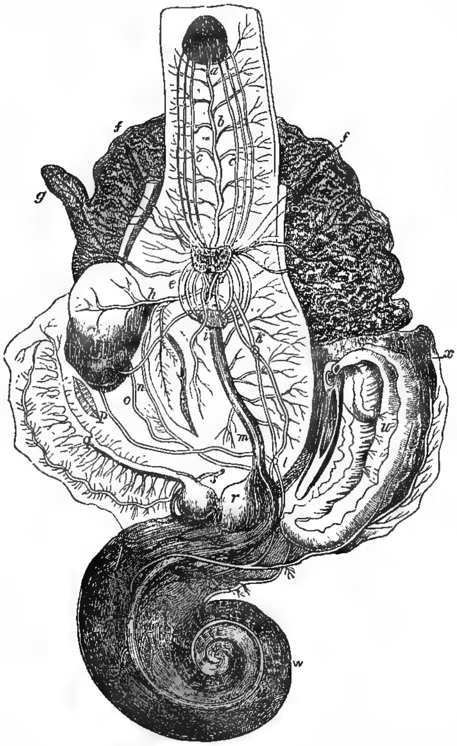


Fig. shewing the soft parts of a Gasteropod (*Dolium Galea*):
a, head; *d*, *d*, foot.



Anatomy of the Whelk (copied from Jones' *Gen. Struc. of An. Kingd.*):
ab, vein of proboscis and its branches; *c*, *c*, nervous branches proceeding from the brain to the extremity of the proboscis; *d*, brain, situated above the œsophagus or gullet; *e*, nervous branches connecting the brain with the great ganglion or nervous mass beneath the œsophagus; *f*, tentacula; *g*, penis; *h*, liver; *i*, a large nervous mass beneath the œsophagus; *k*, *l*, ganglia; *m*, one of the two principal trunks of the aorta, supplying the foot and anterior part of the body; *n*, *o*, nervous branches connecting ganglia; *p*, orifice of respiratory cavity; *q*, branchial vein; *rs*, heart. (*r*, ventricle; *s*, auricle); *t*, one of the two principal trunks of the aorta, winding among the mass of viscera contained in the shell, and distributing its ramifications to them; *u*, branchial fringes, or gills; *w*, posterior part of the body, or mass of viscera contained in the shell; *x*, roof of respiratory cavity thrown back.

which generally carries fleshy, retractile tentacula, varying from two to six in number. The tentacula do not encircle the mouth; they seem to be special and exquisitely sensitive organs of touch, a sense which the general surface of the body does not seem to possess in a high degree; and in some G., as snails, they carry the eyes at their tips, but in others the eyes—always small—are situated elsewhere on the head, and a few are destitute of eyes. They are believed to possess the senses of taste and smell, and at least some of them that also of hearing, as they not only have a nervous centre analogous to the acoustic division of the brain in vertebrate animals, but a little sac on each side, apparently an organ of this sense. Their nervous system is more complex and concentrated than that of the headless (*acephalous*) molluscs; the principal nervous masses surround the gullet. In the highest G., such as snails, there are only two principal nervous masses, one of which, supplying the nerves connected with sensation, is called the brain.—The blood of G. is often opalescent, with a few colourless corpuscles. The heart is always *systemic* only, and in almost all consists of one auricle and one ventricle, although a few G. have two auricles, one for each set of gills. Near the commencement of the aorta, there is often a contractile muscular swelling (*bulbus arteriosus*), as in fishes. Respiration takes place generally by gills, which are very variously situated, sometimes externally, sometimes in a special cavity, and exhibit an equally great variety of form and structure; but some G., as snails and slugs, have, instead of gills, a pulmonary sac or cavity, lined with a vascular net-work, these being either inhabitants of the land, or, if of the water, obliged to come occasionally to the surface for the purpose of breathing. A few of the lowest G., doubtfully placed in this class, are destitute of distinct respiratory organs. The digestive apparatus also exhibits much diversity. Some of the G. feed on vegetable, some on animal substances, and some of them on animals which they themselves kill. Thus, whilst snails eat leaves and other soft parts of vegetables, whelks (*Buccinum*) prey on other molluscs, and are provided with a remarkable apparatus at the end of a proboscis into which the mouth is elongated, for filing a hole —as nice as could be made by the drill of a mechanic—through the hardest shell. The mouth of the snail is, in like manner, admirably adapted to the cutting of leaves or similar substances by the action of the lips against a sharp horny plate. Other G. have the mouth furnished with two cutting blades, wrought by powerful muscles. The tongue of some is covered with minute recurved hooks, to prevent the possibility of anything escaping from the mouth; and the stomach of some is a muscular gizzard, provided with cartilaginous or sometimes calcareous projections, or stomachic teeth, to aid in the comminution of the food. The intestine is generally bent back, so that the anus is not far from the head. The liver is large, as are also the salivary glands of many gastropods. Very great diversities are found in the reproductive system. In some G., the sexes are distinct (G. DIŒCIA); others are hermaphrodite (G. MONŒCIA); and whilst self-impregnation takes place in some of these, others—as snails—mutually impregnate each other by copulation. In general, the reproductive organs are very largely developed, and are of complex and remarkable structure. The G. are in general oviparous; a few are ovoviviparous. The young of aquatic G. at first swim about actively by means of ciliated fins attached to the head. G. are generally unsymmetrical, one side of the body being developed without the other, some of the principal organs of which—the gills and nerves—are atrophied; and thus the shell with which most of them are covered becomes, in the greater number, spiral, the spire turning towards the unatrophied side, which is generally the right side, although in some (*reversed* or *sinistrorsal* shells) it is the left. The head and the organ of locomotion are capable of being withdrawn into the last whorl of the shell, and in aquatic species generally, the mouth of the shell can be closed by an *operculum* (q. v.), exactly fitting it, and attached to the *foot*, but in which many varieties of beautiful structure are exhibited, and which is generally horny, sometimes calcareous. Some shells are simply conical, and there are numerous diversities of form. The shell is secreted by the *mantle*. See Molluscs, Shells, and Univalves. The viscera are contained in a thin sac—part of the mantle—which fills the upper part of the shell. The organ of locomotion, called the *foot*, is in general a muscular disc, developed from the ventral surface of the body; sometimes, as in limpets, capable of acting as a sucker, and exhibiting other even more remarkable modifications, so that in some it becomes an organ for swimming. G. generally creep by means of this disc adhering to surfaces, and contracting in transverse wrinkles or undulations, which begin from behind. The G. generally secrete a peculiar kind of slime. Some of them also produce other peculiar secretions, of which the Tyrian purple affords an example. G. have a great power of renewing lost parts; tentacles are thus restored, and even the eyes which they bear at their tips, the mouth with all its apparatus, or the head itself.

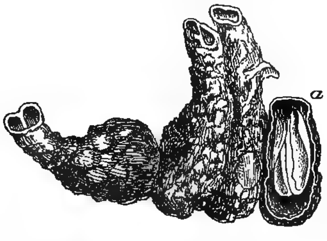
GASTON DE FOIX. See Foix.

GASTRA'LGIA, or **GASTRODY'NIA.** See Cardialgia.

GASTRIC JUICE. See Digestion, Organs and Process of.

GASTRITIS and **GASTRO-ENTERITIS** (inflammation of the stomach, &c.). See Stomach, Diseases of, also Enteritis.

GASTROCHÆ'NA, a genus of lamellibranchiate molluscs, having a delicate shell of two equal valves, gaping very much in front; the animal sometimes taking possession of an already existing cavity, which it often lines with a calcareous lining, so as to form a tube, to which the valves of its shell are cemented; sometimes burrowing for itself in sand, madrepores, or calcareous rocks, and lining its hole with a shelly layer. *G. modiolina*, a rare British mollusc, common in the Mediterranean, perforates shells and limestone, making holes about two inches deep and half an inch in diameter. It sometimes bores right through an oyster into the ground below, and makes for itself a flask-shaped case, with its neck fixed in the oyster-shell. The tubes of some of the tropical species which live in sand are very curious.—To the family *Gastrochænidæ* are referred *Aspergillum* and *Clavagella*.



Gastrochæna Modiolina :
a, one of the tubes broken open, shewing the valves.

GASTROCNE'MIUS MUSCLE, The, is the muscle forming the greater part of the calf of the leg. It arises by two heads from the two condyles of the thigh-bone, and is inserted by the Tendo Achillis (see the diagram in the article Foot) at the posterior part of the heel-bone. In man, these muscles possess great power, and are constantly called in use in standing, walking, leaping, &c. In walking, they raise the heel, and, with it, the entire body from the ground; and the body being thus supported on the raised foot, the other leg is carried forward. From their close association with the erect position, they are much less developed in other mammals than in the human subject.

GASTRO'DIA, a genus of orchids. *G. sesamoides* is a native of Van Diemen's Land, the roots of which form large coral-like masses, and are sometimes called *native potatoes*, being edible; but they are watery and insipid.

GASTRO'STOMY (Gr. *gaster*, the belly or stomach, and *stoma*, mouth), an operation which has been two or three times performed for the relief of stricture of the gullet, to relieve the patient from the imminent risk of starvation, by introducing food directly into the stomach through an external opening. The well-known case of Alexis St Martin, and numerous experiments on the lower animals, have led to this attempt, not unreasonably, to save life; it has not as yet, however, been successful.

GASTRO'TOMY (Gr. *gaster* and *tomē*, an incision), an incision into the cavity of the Abdomen (q. v.) for the purpose of removing some diseased texture or foreign body. The term has also been applied to Cæsarean Section (q. v.).

GATES, Horatio, a general in the American army in the war of independence, was born in England in 1728. He served under General Braddock, and was severely wounded near Pittsburg in the disastrous campaign of 1755, in which Braddock lost his life. On the breaking out of the revolution, G. espoused the popular cause. His military experience and skill procured his rapid promotion, and in 1776 he was appointed major-general. In August 1777, he took the chief command of the American forces north of Albany, then amounting to about 6000 men, besides some detached bodies of militia. Having been reinforced by the troops under General Lincoln, he defeated Burgoyne (October 7 and 8), and soon after compelled that general to surrender with all his army, consisting of about 5600 men. This success, by far the most important that had been gained by the Americans during the war, procured G. the reputation of a consummate general, and some were even desirous to make him commander-in-chief in the place of Washington.

In 1780, G. was appointed to the command of the southern army, which, though amounting to near 6000 men, was composed chiefly of militia. He was totally defeated near Camden, South Carolina, by Lord Cornwallis (whose force was greatly inferior in numbers to that of G.), with the loss of 900 men killed, and as many more taken prisoners. Congress ordered, soon after, an inquiry into the conduct of G., who was, after a protracted trial, honourably acquitted, and reinstated in his command. He died in 1806. 'His experience,' says Bancroft, 'adapted him for good service in bringing the army into order, but he was shallow in his natural endowments and in his military culture.'

GA'TESHEAD, a town of England, in the county of Durham, and an ancient borough under the Episcopal palatines of that county, was formerly governed by a bailiff and burgesses, and became a parliamentary and municipal borough under the Reform Act of 1832, and the Municipal Corporations Reform Act of 1835. It is situated on the south bank of the Tyne, directly opposite Newcastle, to which it is joined by two bridges, and with which it is otherwise so closely connected as virtually to form one town with it. The older portions of the town are poorly built, but great extensions have been made westward and southward, in which directions much ground has been laid out in new streets and detached villas. There are numerous dissenting as well as established churches, a grammar-school founded in 1700, a mechanics' institute, and an hospital (King James's), consisting of the master (who is the rector of Gateshead for the time being) and three brethren who have residences, and twelve others who receive allowances without residence. It has also an excellent dispensary, which was established after a dreadful visitation of cholera in 1831—1832, which carried off 1028 of the population. The numerous coal-mines in the neighbourhood, iron-works and foundries, glass-works, brick, tile, and soap works, ship-building, chemical-works, &c., furnish employment to the inhabitants. There are also extensive manufactures of anchors, machinery, chain-cables, iron-wire and other ropes. At Gateshead Fell are quarries from which the famous grindstones erroneously called, but proverbially known as 'Newcastle grindstones,' are obtained, and exported to all parts of the world. In October 1854, a large portion of the lower part of G., as well as considerable property in Newcastle immediately opposite, was destroyed by an awful explosion and fire, which also caused the death of upwards of 50 persons. G. sends one member to the House of Commons. Pop. in 1851, 25,568; in 1861, 33,589. G. is supposed to have been at one time a Roman station, or outwork to the Roman station at Newcastle, several coins and other relics having been found from time to time. The derivation of the name has been long matter of dispute, but the probability is, that it simply means the head of the *gate* or road with which the Romans connected Newcastle with the southern military divisions and defences.

GATEWAY, the passage or opening in which a gate or large door is hung. This may be either an open way with side pillars or a covered way vaulted or roofed over. The gateway being a most important point in all fortified places, is usually protected by various devices. It is flanked by towers with loopholes, from which assailants may be attacked, and is frequently overhung by a machicolated battlement, from which missiles of every description were poured upon the besiegers. City gates, and gates of large castles, have in all ages been the subjects of great care in construction; and when from some cause, such as the cessation of constant fighting, or a change in the mode of warfare, gateways have lost their importance in a military point of view, they have maintained their position as important architectural works, and where no longer useful, have become ornamental. In very ancient times, we read of the 'gate' as the most prominent part of a city, where proclamations were made, and where the kings administered justice. The Greek and Roman gates were frequently of great magnificence. The propylæa at Athens is a beautiful example, and the triumphal arches of the Romans are the ornamental offspring of their city gates. Most of the towns in this country have lost their walls and city gates; but a few, such as York and Chester, still retain them, and give us an idea of the buildings which formerly existed, but which now remain only in the name of the streets where they once stood. Our castles retain more of their ancient gateways, and from these we may imagine the frowning aspect every town presented during the middle ages. Abbeys, colleges, and every class of buildings were shut in and defended by similar barriers; many of these still exist in Oxford and Cambridge, and the abbey gates of Canterbury and Bury St Edmund's are well-known specimens of monastic gateways. The feeling of personal freedom, which is so strong in this country, must no doubt have tended greatly to hasten the demolition of these marks of feudalism; but on the continent, where every man has to present a passport at the gate of the city before entering it, we still find these barriers kept up.

GATH (in Heb. a 'wine-press'), one of the five chief cities of the Philistines, was situated on the frontiers of Judah, and was in consequence a place of much importance in the wars between the Philistines and the Israelites. It formed, in fact, the key of both countries, and was strongly fortified. The famous Goliath, whose gigantic height and swaggering air so frightened the troops of King Saul, and who was slain by the stripling David with pebbles from the brook, was a native of this place. Jerome describes it in his time as a 'very large village.' The site of ancient Gath is probably the little eminence, about 200 feet high, now known as Tell-es-Sâfret, at the foot of what were once called the Mountains of Judah.

GATINEAU, a large river of North America in Canada East, has its origin in a connected chain of large lakes lying immediately north of the 48th parallel of latitude. It flows in an almost undeviating course south-south-west, and falls into the Ottawa, in lat. 45° 24′ N., long. 75° 43′ W., 12 miles below the town of Aylmer. The length of this river has not been definitely ascertained, but it is said that canoes have navigated it for upwards of 300 miles. Steamers have ascended it for four miles.

GATSCHI'NA, a town of Russia, in the government of Petersburg, and about 30 miles south-south-west of the city of that name, is charmingly situated on a small lake formed by the Ishora. It is regularly built, has an educational institution for foundlings, a horticultural school, and some manufactures of porcelain; but is especially worthy of mention for its royal palace, a structure at once simple in its style and imposing in its effect. This palace, which contains 600 apartments, and is surrounded by one of the finest pleasure-gardens in Europe, was the favourite seat of the Emperor Paul I., who bestowed municipal rights upon the town of G. in 1797. Pop. variously stated at from 4500 to 7000.

GAU (of doubtful origin, possibly allied to Gr. *ge*, land), a German word meaning, in a general way, country (as opposed to the town), district; but applied specially to a political division of ancient Germany, having relation to the arrangements for war and the administration of justice. A gau embraced several communities or villages, and had one or more grafs (q. v.) and judges over it. As the grafdoms became more and more hereditary, the gau, as a political division, fell into disuse (about the 12th c.), and only in the names of some places do the traces of it remain. The Abbot Bessel gave a complete account of the geography of the German gaus in his *Chronicon Gottwicense;* and Spruner's *Historical Atlas* contains a map of them. The nature of the gau system is fully discussed in the works of Eichhorn, Waitz, and Bethmann-Hollweg. See HUNDRED.

GAUGE. See GAGE.

GAUGER, an officer of Excise, whose duty it is to gauge or measure casks containing exciseable liquors or other commodities. Such persons are precluded from dealing in exciseable commodities under the penalty of forfeiture of office, and incapacity to fill any other in connection with the excise; and the crime of accepting a bribe is punishable with the penalty of £500, and incapacity for any government office.

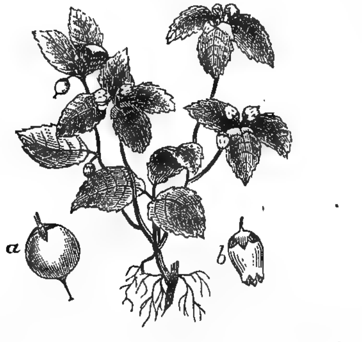
GAUL. See FRANCE.

GAULT, a member of the Cretaceous Formation (q. v.), separating the Lower from the Upper Greensand. It consists of an upper part, hard and sandy, and containing green particles scattered through it; and of a lower portion, a stiff dark gray, blue, or brown clay, smooth and uniform in texture, and very plastic, which is manufactured into tiles, bricks, and even common pottery. Concretions of iron pyrites and other nodules are not uncommon in the Gault. The contained fossils are for the most part beautifully preserved, having been protected from decay by being buried in the tenacious and compact mud which forms the Gault beds. The most abundant remains are those of cephalopodous molluscs, as ammonites, scaphites, and turrilites.

The Gault occurs at Folkstone, and stretches west through Kent and Surrey into Hampshire, and then, turning eastwards through Sussex, it is seen on the coast near Beechy Head. It also stretches in a narrow line from Dorsetshire, in a north-easterly direction, through the centre of England, till it reaches the coast at Hinstanton, in Norfolk. Its maximum thickness is 150 feet. In Surrey, the Gault supplies considerable quantities of phosphatic nodules, largely used by agriculturists for fertilising soils.

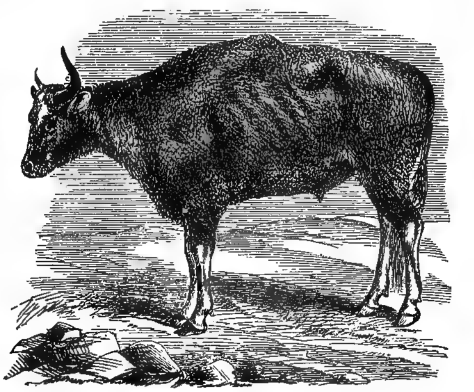
The Blackdown beds in Dorsetshire are probably contemporaneous with the Gault, the one having been deposited near the shore, while the fine mud of the Gault was carried out to sea. The Blackdown beds, however, contain Greensand fossils mixed with those of the Gault, so that the exact age of the deposit is still doubtful.

GAULTHE'RIA, a genus of small procumbent or nearly procumbent evergreen shrubs, of the natural order *Ericeæ*, the fruit of which is a 5-valved capsule, covered with the enlarged and fleshy tube of the calyx. They are natives of temperate regions. *G. procumbens* is a common plant in North America as far south as Virginia, and bears the names of Partridge Berry, Deer Berry, Winter Green, and Mountain Tea. It is about four or five inches in height, with small whitish flowers and red 'berries,' which are eatable, but not safe in any considerable quantity, because of the pungent volatile oil which they contain. Brandy in which they have been steeped is used as a tonic. The whole plant has an agreeable aromatic odour and taste, owing to the presence of volatile oil, which, when extracted, is used in medicine as a stimulant, also by druggists for flavouring sirups, and to a considerable extent in perfumery, under the name of *Oil of Winter Green*. The leaves are used both as an astringent and as a stimulant; and an infusion of them is used as tea in America, for which purpose those of another species are also employed in Nepal.—The Shallon (*G. shallon*) is a comparatively large species, two or three feet high, with purple berries, which are agreeable to the palate, and form a considerable part of the food of Indians in the north-west of America, of which the plant is a native. It grows well under the shade of woods, and has of late been planted in many places in Britain, to afford food for pheasants and other kinds of game.—*G. hispida* is a native of Van Diemen's Land, bearing snow-white berries, and known by the name of Wax-cluster. The berries are eaten.—Other species, some of which are fragrant, some produce edible berries, and all are beautiful little shrubs, are found in the Himalaya Mountains, the mountains of South America, Australia, &c. The Australian *G. antipoda* is said to be a finer fruit than *G. hispida.*



Procumbent Gaultheria (*Gaultheria procumbens*): *a*, fruit; *b*, flower.

GAUR, or **GOUR** (*Bos Gaurus*), a species of ox, inhabiting some of the mountain jungles of India. It is of very large size, although apparently inferior to the Arnee (q. v.). It bears a considerable resemblance to the Gayal (q. v.), but differs from it in the form of its head, and in the total want of a dewlap, in which it more nearly agrees with the Banteng of the Eastern Archipelago, although distinguished from it by important anatomical peculiarities. See Banteng. The back is strongly arched, having a remarkable ridge of no great thickness, which rises above its general line, owing to an unusual elongation of the spinous processes of the vertebræ. The hair is remarkably short and sleek. The G. is formidable even to the tiger, and safe from his attacks. It is usually found in herds of from ten to twenty. It is extremely abundant in the high insulated table-land of Myn Pat, in South Bahar, and in the adjoining steep and narrow valleys. It is supposed to be incapable of domestication; frequent attempts for this purpose are said to have been made in Nepal.



Gaur (*Bos Gaurus*).—From Routledge's *Natural History.*

GAU'RITZ, a river of the south coast of the Cape Colony, in South Africa, forms the eastern boundary of the district of Zwellendam, entering the sea a little to the west of Mossel Bay. Like nearly all the streams of this region, it is rapid, and almost useless for the purposes of navigation.

GAUSS, Karl Friedrich, one of the most illustrious mathematicians of modern times, was born at Brunswick on the 30th of April 1777. In 1795, he went to the university of Göttingen, where, at this early age, he made a number of important discoveries, one of which may be mentioned, as it had occupied the attention of geometers from the time of Euclid, viz., the division of the circle into 17 equal parts.

He soon afterwards returned to Brunswick, and there, in 1801, published his *Disquisitiones Mathematicæ*, a work treating of indeterminate analysis or transcendental arithmetic, which contains, besides other important theorems, a new demonstration of that of Fermat concerning triangular numbers. While G. was at work on these speculations, he was in great measure ignorant of what had been done in the same subject by previous mathematicians, which accounts for the presence in his work of a number of old theorems. But the discovery of the planet Ceres on the first day of the 19th c. guided the energies of G. into a new field of research. He was one of the first to calculate the elements of its orbit, according to methods of his own invention, and his assiduous application, and the accuracy of his results, excited general admiration. On the discovery of Pallas by Olbers in 1802, G. set himself to calculate its orbit; and his results, valuable at the time, are even now models of ingenuity and research. For these labours, he received, in 1810, from the French Institute, the medal founded by Lalande. In 1807, he was appointed director of the Observatory at Göttingen, an office peculiarly suited to his tastes, and about this time commenced to prepare for publication his celebrated work, *Theoria Motus Corporum Cœlestium in Sectionibus Conicis Ambientium*, which appeared in 1809. In this work, G. has developed a method of calculating, in the most simple, and at the same time most exact manner, the orbits of the bodies in the solar system. It is also to him that the credit is chiefly due of discovering the great comet of 1811, the elements of whose orbit he calculated with the most surprising accuracy.

In 1821, G. was charged by the Hanoverian government with the triangulation of the kingdom of Hanover, and the measurement of an arc of the meridian. In executing this work, G. found that the appliances then in use did not allow of the vertices of the triangles being seen from a considerable distance with sufficient distinctness, and to remedy this defect, he invented the Heliotrope (q. v.). About 1831, Wilhelm Edward Weber arrived at Göttingen, and communicated to G. a part of his own enthusiasm for magnetic researches. It would take up too much space to give a full account of the many discoveries he made in this new branch of study; suffice it to say, that he has invented a 'magnetometer' which measures the 'magnetic intensity' with great accuracy, and that he has probably contributed more to the advancement of this branch of science than any one before him. G. was pronounced by La Place to be the greatest mathematician of Europe. He died at Göttingen on the 23d of February 1855. Among his most celebrated works, besides the two above mentioned, are the *Disquisitio de Elementis Ellipticis Palladis ex Oppositionibus Annorum* 1803—1809 (1810); *Theoria Combinationis Observationum Erroribus Minimis Obnoxiæ* (Göttingen, 1823), containing a full explanation of his peculiar method above mentioned; *Intensitas vis Magneticæ Terrestris ad Mensuram Absolutam Revocata* (1832), &c.

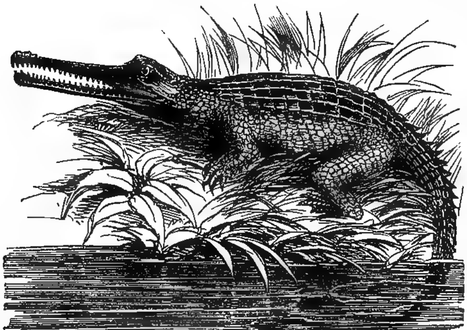
GAUZE, a light transparent silken fabric, supposed to have derived its name from having first been manufactured in Gaza, a city of Palestine. France and Switzerland produce considerable quantities of gauze. The chief seats of the manufacture in Great Britain are Paisley and Glasgow, and the surrounding districts. The openness of texture is obtained by crossing the warp threads between each thread of the weft, so that the weft passes through a succession of loops in the warp, and the threads are thus kept apart, without the liability to sliding from their places, which would take place if simple weaving were left so loose and open. Inferior qualities of gauze are made of a mixture of silk and cotton.

GAVA'ZZI, Alessandro, a popular Italian preacher and reformer, distinguished by his patriotic zeal in promoting the civil and religious progress of his country, was born at Bologna in 1809. At the early age of 16, he became a monk of the Barnabite order, and subsequently was appointed professor of rhetoric at Naples, where he speedily acquired great reputation as an orator. By his uncompromising advocacy of church and state reformation, he earned at once the enthusiastic admiration of the progressive party among his countrymen, and the bitter enmity of the priestly and ruling powers.

On the accession of Pius IX. to the papal chair, G. was one of the foremost supporters of the liberal policy that inaugurated that pontiff's reign; and having repaired to Rome, he devoted himself to the diffusion of political enlightenment and patriotic aspirations among the masses of the Roman population. The pope sanctioned his political labours, and appointed him almoner of a body of 16,000 Roman troops, who volunteered for the campaign of Lombardy in 1848, and quitted Rome to proceed to Vicenza. To G.'s fervid and patriotic oratory may be attributed, in no slight degree, the universal spirit of self-sacrifice evoked throughout Italy during this period of her history. He was called the *Pietro Eremita*, or Peter the Hermit of the national crusade. The Roman legion having been recalled by the pope, G. continued in Florence, Genoa, and Bologna, to agitate in favour of the national movement. On the establishment of the republic at Rome, he was appointed almoner-in-chief to the national army. Under his superintendence, efficient military hospitals were organised and attended by a band of Roman ladies, who volunteered their services and co-operation in the care of the wounded. Rome having fallen, G. escaped to England, where he delivered numerous addresses and lectures, illustrative of the political and religious aims of his country. Recent events have enabled him to return again to Italy, and he is once more the foremost of his fellow-countrymen in the advocacy of the civil and religious progress of his native land. He has for some time completely broken with the papacy, not only in its temporal, but in its religious aspect; yet he is not, and does not wish to be considered as exactly a Protestant. He proclaims the necessity of a return to primitive and apostolic Christianity, but is not disposed to accept for Italy any ready-made theological system from abroad. His leading doctrine, however, 'Justification by Faith,' is apparently the same, at least in form, as that held by the reformers of the 16th century.

GA'VELKIND. Lappenberg, who, though a foreigner, when endorsed by his translator Thorpe, may be considered as the very highest authority on the subject of English social antiquities, thus speaks of the custom of gavelkind: 'A fact worthy of notice is the existence down to recent times of the old British law of succession in Wales, Kent, and some parts of Northumberland, called gavelkind. As far as we are enabled to understand it, in its mixture with Anglo-Saxon law, all the sons of the father inherited, but the youngest possessed the homestead; the eldest, or the next following capable of bearing arms, had the heriot—that is, the arms offensive and defensive of his father, and his horse. Even the son of an outlaw could not be deprived of the entire succession, but of the half only' (vol. i. p. 39). Though a Celtic origin is here, as by Blackstone (Stephen, iv. p. 548), probably with reason, ascribed to this tenure, it seems to be the general opinion of legal antiquaries (Selden, *Analect.* l. 2, c. 7; Stephen, vol. i. 213) that it prevailed over the whole kingdom in Anglo-Saxon times, and that in Kent and elsewhere it was among the 'liberties' which the people were permitted to retain at the Conquest. Most of the many derivations which have been suggested for the word are, moreover, Teutonic—*gif eal cyn*, equivalent to Lord Coke's *gave all kinde*, or the custom which gives to all children alike, being the most probable. In Wales, gavelkind obtained universally till the time of Henry VIII. (34 and 35 Henry VIII. c. 26), and in some parts of England it is not yet abolished. In Kent, all lands that have not been disgavelled by act of parliament, are held to be gavelkind—a fact which ought to be borne in mind in all transactions with Kentish property. In addition to the characteristics of this tenure already noticed, Blackstone mentions the following: '1. The tenant is of age sufficient to alien his estate by feoffment at the age of 15. 2. The estate does not escheat in case of an attainder for felony; their maxim being, "the father to the bough, the son to the plough." 3. In most places, the tenant had a power of devising lands by will before the statute authorising the devise of lands generally was made.'

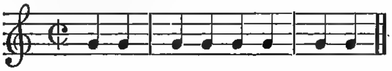
GA'VIAL (*Gavialis*), a genus of reptiles of the Crocodile (q. v.) family, conspicuously differing from true crocodiles and from alligators in the great length and slenderness of the muzzle. Another peculiar character is a large cartilaginous swelling at the extremity of the muzzle in the males, around the orifice of the nostrils. The teeth are very numerous, about 120; they are more equal in size than those of the other animals of this family, although some of the first are rather larger than the rest, the longest of the lower jaw being received into notches in the upper, as in the true crocodiles. The head is very broad, the narrow muzzle begins abruptly, and in it the branches of the bone of the lower jaw are united and prolonged as one. There are two great perforations in the bones of the skull behind the eyes, externally marked by depressions. The plates which cover the back and the nape of the neck are united. The crest of the tail is much elevated; the feet are webbed to the extremity of the toes; the whole habits as aquatic as those of the crocodile of the Nile. The only perfectly ascertained species, *G. Gangeticus*, inhabits the Ganges. It attains a greater size than any other of the recent *Crocodilidæ*, frequently attaining the length of 25 feet; but owing to the slenderness of its muzzle, it is esteemed less dangerous than a true crocodile of smaller size. The form of the muzzle seems particularly to adapt it for preying on fish. The cartilaginous swelling at the extremity of the muzzle seems to have given rise to Ælian's statement, that the crocodile of the Ganges had a horn at the tip of its snout. Fossil gavials, different from the existing species, have been found in Eocene deposits, as at Bracklesham, in England.



Gavial (*Gavialis Gangeticus*).

GAVINANA, or **CAVINANA**, a village of 622 inhabitants, picturesquely situated amid the Tuscan Apennines, in the valley of the river Lima, owes its interest to the memorable battle fought around its walls in 1530, between the republican forces of Florence, led by their great captain, Ferruccio, and the Imperialists headed by Philibert, Prince of Orange. The Florentines were defeated with the loss of their commander; and the death of Ferruccio, whose name in Tuscany has become synonymous with chivalry and patriotism, gave the final blow to the liberties of the republic.

GAVOTTE, a piece of music of a lively character, peculiarly suitable for dancing, but more adapted for the stage than for private performance. It consists of two repetitions of eight bars each, beginning with an up-beat, and is in alla-breve time. The fundamental rhythm of the gavotte is therefore



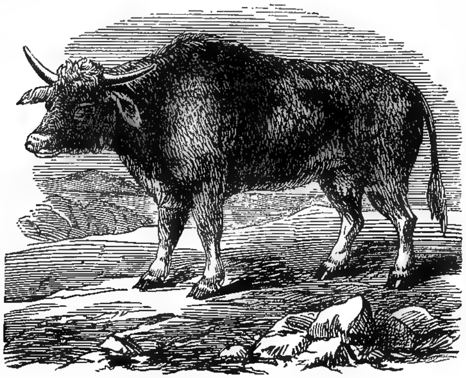
by which the second bar has a remarkable cæsura. Formerly, the gavotte was often introduced into sonatas and other pieces, where its form was not so strictly adhered to; still the eight-bar repetition was always considered necessary.

GAY, JOHN, was born at Barnstaple, in Devonshire, in 1688. Although of an ancient family, his father was in reduced circumstances, and G. was apprenticed to a London silk-mercer; but disliking his occupation, he was finally released from it by his master. In 1711, he published a descriptive poem, dedicated to Pope. The year after, he was appointed secretary to the Duchess of Monmouth. His next work was *The Shepherd's Week, in Six Pastorals,* which gained considerable applause. About the same time he produced *Trivia* and *The Fan*, full of descriptions of low city-life, a good deal in Swift's style—indeed, he was assisted by Swift in the former work. In 1713, appeared his comedy, *The Wife of Bath*, which did not succeed. Next year, he relinquished his situation in the family of the Duchess of Monmouth, and accompanied Lord Clarendon, then envoy-extraordinary to Hanover, as his secretary. Within two months, he was again in London, where, at the instigation of Pope, he wrote a poem on the Royal Family, and shortly afterwards produced his play, *What d'ye Call It?* Encouraged by its success, he brought out another play entitled *Three Hours after Marriage*, which failed signally. In 1720, he published his poems by subscription, and is said to have realised £1000 thereby. He at the same time received a present of South Sea stock, and was considered a rich man, when all his sudden fortune was lost in the collapse of that famous bubble. In 1724, he produced his play of *The Captives*, and wrote a volume of *Fables* in 1726. When Swift came to live with Pope at Twickenham in 1726, he talked to G. of a Newgate pastoral, and *The Beggars' Opera* was the result. The success of this piece was immense; it had a run of sixty-three nights, and took captive town and country. G. afterwards wrote a sequel, entitled *Polly*, but owing to some misunderstanding with the lord chamberlain, its representation was prohibited. On its publication, it brought the author £1200. About this time, he went to live with the Duke of Queensberry, and remained with him during the rest of his life. He was seized with an inflammatory fever, and died after an illness of three days. His death took place on the 4th December 1732, and he was buried in Westminster Abbey.

Although more than a century has elapsed, and the satire and the allusions are obsolete, *The Beggars' Opera* is still occasionally represented. It exists, however, mainly in virtue of its songs and music. G. had a happy lyrical vein, and could turn a stanza on the beauty of woman, and the fascinations of the wine-cup, and the fleeting of youth, with considerable grace. His *Fables*, and his serious and comic poems, are only now to be found in libraries. The wit and the sentiment are alike dust. Of all he has done, his ballad of *Black-eyed Susan* possesses the strongest vitality, and thrills now and then our theatres and concert-rooms.

GAY'AH, the capital of the district of Bahar, in the sub-presidency of Bengal, stands on the Phalga, an affluent of the Ganges, in lat. 24° 48′ N., and long. 85° 4′ E. It contains about 45,000 inhabitants; but as it is a place of great sanctity, it is annually visited by at least 100,000 pilgrims. It consists of two towns—the older being reserved for the Brahmins and their immediate dependents, and the newer being occupied by the population at large—and on an intermediate area stand the public establishments. The people rely chiefly on the expenditure of the superstitious visitors, some of whom have been known to leave behind them £5000 each.

GAYAL (*Bos Gavæus*), a species of ox, found wild in the mountains of Aracan, Chittagong, Tipura, and Sylhet, and which has long been domesticated in these countries and in the eastern parts of Bengal. It is about equal in size to the Indian buffalo; and, like the buffalo, it carries the head with the muzzle projecting forward. The head is very broad and flat at the upper part, suddenly contracted towards the nose; with short horns, a little curved, projecting nearly in the plane of the forehead, and a very wide space between them at the base. There is no proper hump, but a sharp ridge on the shoulders and fore-part of the back. The prevailing colour is brown, generally dark. The Kookies keep herds of gayals, which they permit to roam at large during the day in the forests, but which return home at night of their own accord; to secure which the animals are occasionally supplied with a little salt, which has the greatest attractions for them. Their milk is extremely rich, but not abundant; the Kookies, however, do not use the milk, but rear them entirely for their flesh and skins.



Gayal Cow (*Bos Gavæus*).

GAY-LUSSAC, Louis Joseph, one of the most distinguished chemists and physicists of recent times, was born on the 6th of December 1778, at St Léonard (Haute-Vienne). In 1795, he was sent to Paris to prepare for the examinations requisite for admittance into the Polytechnic School; and his admission to that institution took place on the 27th December 1797. After three years' study, he was promoted to the department *Des Ponts et Chaussées*. Berthollet, who was then Professor of Chemistry in the Polytechnic School, having recognised his zeal and talents for original research, selected him as his assistant at Arcueil, where the government chemical works were situated. The study of Dalton's *Experimental Essays*, published in 1801, directed the attention of the young chemist to the department of chemical physics. In that year he published his first Memoir, which treated of 'the dilatation of gases and vapours,' and which was speedily followed by others on 'the improvement of thermometers and barometers;' on 'the tension of vapours, their mixture with gases, and the determination of their density, &c.;' and on 'capillary action.' In consequence of the reputation which he acquired from these researches, he was commissioned, in association with Biot, by the Institute of France, to make a balloon ascent, with the view of ascertaining whether the magnetic force existed at considerable heights above the surface of the earth, or only on the surface, as had been asserted by some physicists. A notice of this ascent, and of another ascent which he made alone, is given in the article Balloon. Alexander von Humboldt investigated with him the properties of air brought down from a height of more than 23,000 feet, and their joint Memoir to the Academy of Sciences (read on the 1st of October 1804) contained the first announcement of the fact, that oxygen and hydrogen unite to form water in the simple proportion of 100 parts by bulk (volumes) of the former to 200 parts of the latter. The simplicity of the ratio in which these gases stood to each other in their combining proportions, induced him to study the combining volumes of other gases, and thus led him to the important discovery of the *law of volumes*, which was announced in 1808, and is one of the most general and important laws in the whole domain of chemistry. Davy's discoveries of potassium and sodium, by the decomposing action of the voltaic pile, having excited much attention in France, Napoleon directed G. and Thenard to pursue this class of researches. The results of these investigations appeared in their *Recherches Physico-chimiques*, in two volumes, published in 1811. Amongst the most important of the discoveries announced in these volumes, are a new chemical process which yields potassium and sodium much more abundantly than the voltaic pile, the determination of the composition of boracic acid both analytically and synthetically, and new and improved methods of analysing organic compounds. (Boron was, however, simultaneously discovered in England by Davy.) Although the discovery of iodine (in 1811) is due to Courtois, it was G. who (in 1813) first described its distinctive properties, gave it the name which it now bears, and proved that it is an elementary body; he was also the first to form synthetically the compounds of iodine with hydrogen and oxygen, known as hydriodic and iodic acids. In 1815, he announced the discovery of cyanogen, which presented the first known example of a compound body (C_2N) exhibiting many properties which were previously believed to pertain specially to simple or elementary bodies. His Memoir on this compound, in the 95th volume of the *Annales de Chimie*, is a model of what a complete and exhaustive chemical investigation should be. Our space will not allow of more than a passing allusion to his subsequent investigations regarding the fabrication of hydrated sulphuric acid, his essays on the bleaching chlorides, on the alcohols, and on the alkalies employed in commerce. In 1805, he was chosen a member of the Committee of Arts and Manufactures, established by the Minister of Commerce. In 1818, he was appointed to superintend the government manufactory of gunpowder and saltpetre; and in 1829, he received the lucrative office of chief assayer to the mint, where he introduced several important chemical changes. In 1831, he became a member of the Chamber of Deputies; and in 1839, he was made a peer of France. He never, however, took an active part in politics, and was diligently engaged in scientific research until his last illness. For many years, he was the editor, in association with Arago, of the *Annales de Chimie et de Physique*. He died at Paris, 9th May 1850, from atrophy of the heart.

GAZA, THEODORUS, a successor of Emanuel Chrysoloras as teacher of the Greek language and literature in the West. When his native city, Thessalonica, fell into the hands of the Turks, in 1430, he fled to Italy, where he studied the Latin language, under Victorinus of Feltre, at Mantua; after 1441, he was appointed rector of the newly established gymnasium, or high school, of Ferrara, and professor of Greek. He was invited by Pope Nicholas V., along with other learned Greeks, to Rome, and was employed in making Latin versions of Greek authors. After the death of Nicholas, King Alfonso invited him to Naples in 1456; but two years after, the death of this monarch also necessitated his return to Rome, where he found a patron in Cardinal Bessarion, who obtained for him a small benefice in the south of Italy, either in Apulia or Calabria. Here he died in 1478, at an advanced age.

G. has been warmly praised by subsequent scholars, such as Politian, Erasmus, Scaliger, and Melancthon. His principal writings are his *Introductivæ Grammatices*, libri iv. (a work on the elements of Greek grammar, first published by Aldus Manutius at Venice, 1495 A.D., and long held in high repute), a number of epistles to different persons on different literary subjects, and a variety of important translations into Latin of portions of Aristotle, Theophrastus, St Chrysostom, Hippocrates, and other Greek writers.

GAZA (Heb. signifies 'strong'), (now called GUZZEH), a town in the south-west of Palestine, is situated about three miles from the sea, on the borders of the desert which separates Palestine from Egypt. It originally belonged to the Philistines, and was a place of importance at the period of the conquest of Canaan by the Israelites. It is frequently mentioned in the history of Samson; and after many vicissitudes in the wars between the Israelites and the Philistines, it was allotted to the tribe of Judah, in whose possession it finally remained. In the year 333 B.C., G. was taken by Alexander the Great; and from that period down to 1799, when it was taken by the French under Kleber, it has been the scene of many battles and sieges. Constantine the Great, who rebuilt the town, made it the seat of a bishop. The modern G. has the appearance of being a collection of mere villages. It has no gates, no fortifications or defences of any kind. The only building of interest is the great mosque, with its tall octagonal minaret and peaked roof. G. has manufactures of soap and cotton stuffs; and, owing to its situation near the Mediterranean and on the caravan route to Egypt, it has a good trade both by sea and land. Pop. upwards of 15,000, from 200 to 300 of whom are Christians, and the rest Mohammedans.

GAZE, in Heraldry. When a beast of the chase, as a hart or stag, is represented as *affrontée*, or full-faced, it is said to be at gaze.

GAZE'LLE (*Antilope Dorcas* or *Gazella Dorcas*), a species of antelope, about the size of a roebuck, but of lighter and more graceful form, with longer and more slender limbs, in these respects exhibiting the typical characters of the antelopes in their highest perfection. It is of a light tawny colour, the under parts white; a broad brown band along each flank; the hair short and smooth. The face is reddish fawn-colour, with white and dark stripes. The horns of the old males are nine or ten inches long, bending outward and then inward, like the sides of a lyre, also backward at the base, and forward at the tips, tapering to a point, surrounded by thirteen or fourteen permanent rings, the rings near the base being closest together and most perfect. The horns of the female are smaller and obscurely ringed. The ears are long, narrow, and pointed; the eyes very large, soft, and black; there is a tuft of hair on each knee; the tail is short, with black hairs on its upper surface only, and at its tip. The G. is a native of the north of Africa, and of Syria, Arabia, and Persia. Great herds of gazelles frequent the northern borders of the Sahara; and notwithstanding their great powers of flight, and the resistance which they are capable of making when compelled to stand at bay—the herd closing together with the females and young in the centre, and the males presenting their horns all around—lions and panthers destroy them in great numbers. The speed of the G. is such that it cannot be successfully hunted by any kind of dog, but in some parts of the East it is taken by the assistance of falcons, of a small species, which fasten on its head, and by the flapping of their wings blind and confuse it, so that it soon falls a prey to the hunter. It is also captured in enclosures made near its drinking-places. Although naturally very wild and timid, it is easily domesticated, and, when taken young, becomes extremely familiar. Tame gazelles are very common in the Asiatic countries of which the species is a native; and the poetry of these countries abounds in allusions both to the beauty and the gentleness of the gazelle. It has been supposed that the gazelles of Asia may be of different species from the African, but there is reason to think that they are the same. The Ariel G. (*A. Arabica*) perhaps differs rather as a variety than as a species, and is even more symmetrical and graceful than the common kind. There are several species very nearly allied to the G., among which is *Antilope* (or *Gazella*) *Soemmeringii*, a native of Abyssinia, with the curvatures of the horns very marked and sudden.—Some confusion has arisen among naturalists as to the application of the name G., originally Arabic; and it has not only been given to the *leucoryx* of the ancients, a very different species, but even to the *gemsboc* of South Africa. The true G. was known to the ancients, and is accurately described by Ælian under the name *dorcas*, which was also given to the roe.

GAZE'TTE. A gazette was a Venetian coin worth somewhat less than a farthing; and the name was hence applied to a sort of gossiping sheet, or primitive newspaper, that was sold for that sum at Venice. See Newspaper. In its English acceptation, it means the official newspaper, in which proclamations, notices of appointments, and the like, are published by the government. The *Gazette* is said to have been published for the first time at Oxford in 1665. On the removal of the court to London, the title was changed to the *London Gazette.* It is now published on Tuesdays and Fridays. Proclamations printed in the *Gazette* are probative, without production. But the rule is different as to presentations or grants to private persons. Publication of a dissolution of partnership in the *Gazette* is not a sufficient notice to persons who were formerly in the habit of dealing with the company. Even as regards parties dealing for the first time, the tendency in England is to doubt the sufficiency of such notice in all cases; whereas, in Scotland, the opposite tendency prevails, and it is held that persons contracting with a company for the first time are bound to inquire into its existing condition, and consequently that notice even in a provincial newspaper may suffice. In practice, all reasonable means ought to be resorted to. Under the Bankrupt Act and other statutes, certain notices are directed to be given in the *Gazette.*

GAZETTEER. See Dictionary and Encyclopædia.

GAZOGENE. See Aerated Water.

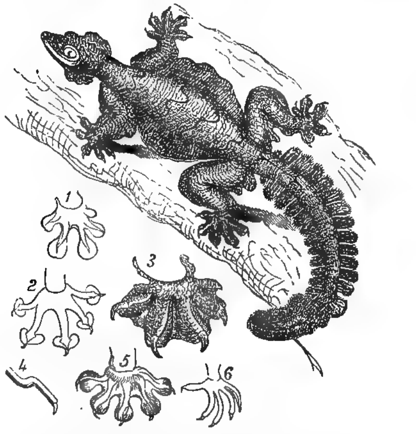
GAZONS, in Fortification, are sods laid over newly made earthworks, to consolidate them, and prevent the soil from rolling down.

GEARING, a term applied to the parts of machinery by which motion in one part of a machine is communicated to another; gearing consists in general of toothed-wheels, friction-wheels, endless bands, screws, &c., or of a combination of these. When the communication between the two parts of the machine is interrupted, the machine is said to be *out of gear;* and when the communication is restored, it is said to be *in gear.* In the case of a thrashing-mill, e. g., driven by a steam-engine, the gearing usually consists of an endless band which communicates motion from the axle of the fly-wheel to that of the drum. If the band were slipped off from one wheel, or slackened so that motion could not be communicated by means of it, then the machine would be *out of gear.* Gearing which can be put in and out of gear is called *movable gearing;* that which cannot, as, for instance, the wheel-work of a watch, is called *fixed gearing.* Gearing which consists of wheel-work or endless Screws (q. v.) is put out of gear either by means of one of the wheels sliding along its axis, or being moved out of its place horizontally or vertically by means of a lever. *Straight gearing* is used when the planes of motion are parallel to each other; *bevelled gearing,* when the direction of the plane of motion is changed. See Wheels, Toothed. Gearing has also for its object the increasing or diminishing of the original velocity, and in reference to this, is distinguished by the term 'multiplying' or 'retarding.' See Wheels, Toothed.

GEBA RIVER. See Senegambia.

GEBANG PALM (*Corypha Gebanga*), a fan-leaved palm, native of the East Indies, and one of the most useful palms of that part of the world. Its stem yields a kind of sago; its root is medicinal, being both emollient and slightly astringent, so as to be particularly adapted to many cases of diarrhœa; its leaves are used for thatch, for making broad-brimmed hats, and for various economical purposes; its young leaves are plaited into baskets and bags, in the manufacture of which many of the people of Java find much employment; the fibres of its leaf-stalks are made into ropes, baskets, nets, cloth, &c.—To the genus *Corypha* belongs also the Talipat Palm (q. v.).—The fruit of *C. Pumas*, a Mexican species, is eatable, and has a sweet taste.

GEBIR, Abu-Mussah-Jaafer Al Sofi, the founder of the Arabian school of chemistry, flourished towards the end of the 8th, or the commencement of the 9th century. The place of his birth is uncertain. According to the majority of authorities, he was born at Tûs, in Khorassan, but Abulfeda supports the claims of Harran in Mesopotamia. He was greatly esteemed in the East, and subsequently in Europe, where the chemists, down to the time of Van Helmont, did nothing more than repeat his experiments. Cardan reckons G. one of the twelve subtlest geniuses of the world, while Roger Bacon bestows upon him the epithet 'magister magistrorum.' He wrote an immense number of treatises on alchemy, of which a considerable number are extant in the form of Latin versions. The library of Leyden contains many manuscripts of G.'s works which have never been published. In the Imperial Library at Paris there are manuscripts of his two celebrated works, the *Summa Collectionis Complementi Secretorum Naturæ*, and the *Summa Perfectionis*—also of a work on Astronomy, and a treatise on Spherical Triangles. The principle laid down by G. at the commencement of his works is, that art cannot imitate nature in all things, but that it can and ought to imitate her as far as its limits allow. An edition of his works in Latin was published at Dantzic in 1682, and another in English by Russell (London, 1678). For information respecting G.'s opinions with regard to alchemy, see Alchemy.



Gecko (*Platydactylus homalocephalus*):
1. Foot of P. Cepedianus; 2. Foot of P. Hasselquistii; 3. Foot of P. Leachianus; 4. Claw of Gymnodactylus pulchellus; 5. Foot of Thecadactylus theconyx; 6. Foot of Gymnodactylus scaber.

GECKO (*Gecko*), a genus of Saurian reptiles, constituting a family, *Geckotidæ*, which some recent naturalists have divided into many genera. The geckos are of small size, and generally of repulsive aspect; the colours of most of them are dull, and the small granular scales with which they are covered are in general mingled with tubercles. The legs are short, the gait usually slow, measured, and stealthy, although geckos can also run very nimbly when danger presses, and often disappear very suddenly when they seem almost to be struck or caught. The feet are remarkable, being adapted for adhering to smooth surfaces, so that geckos readily climb the smoothest trees or walls, or creep inverted on ceilings, or hang on the lower side of the large leaves in which tropical vegetation abounds. The body and tail are never crested, but are sometimes furnished with lateral membranes, variously festooned or fringed. The lateral membrane is sometimes even so large as to be of use to arboreal species in enabling them to take long leaps from branch to branch. The geckos feed chiefly on insects. They are more or less nocturnal in their habits. They are natives of warm climates, and are very widely distributed over the world. Two species are found in the south of Europe, both of which frequently enter houses, as do the geckos of Egypt, India, and other warm countries. The name G. is derived from a peculiar cry often uttered by some of the species, and which in some of them resembles syllables distinctly pronounced, whilst others are described as enlivening the night in tropical forests by a harsh cackle. The geckos have, in almost all parts of the world where they are found, a bad reputation as venomous, and as imparting injurious qualities to food which they touch, but there is no good evidence in support of any such opinion, in accordance with which, however, an Egyptian G. is even known as *the father of leprosy.*

GEDDES, Alexander, LL.D., a biblical critic, translator, and miscellaneous writer, was born at Arradowl, in the parish of Ruthven, Banffshire, in 1737. His parents were Roman Catholics, and young G. was educated for a priest, first at Sculan, a monastic seminary in the Highlands, and subsequently at the Scots College, Paris, where he acquired a knowledge of Hebrew, Greek, Italian, French, Spanish, German, and Low Dutch. In 1764, he returned to Scotland, and, having taken orders, he was appointed officiating priest to the Roman Catholics of Angus, but after a short time went to reside with the Earl of Traquair. In 1769, he undertook the charge of a Roman Catholic congregation at Auchinhalrig, in Banffshire, where he remained for ten years, making himself during that period honourably conspicuous by his charities and extraordinary liberality of sentiment. He was at length deposed from all his ecclesiastical functions, on account of his occasional attendance at the parish church of Cullen, between the minister of which and himself there existed an intimate acquaintance. G. now resolved to betake himself to literature, and proceeded to London in 1780. He had long planned a translation of the Bible into English for the use of Roman Catholics, and he was now, through the munificence of Lord Petre, enabled to devote himself to the work. After various preliminary publications intended to pave the way for an impartial or favourable consideration of his *magnum opus*, there appeared in 1792 *The First Volume of the Holy Bible, or the Books accounted Sacred by Jews and Christians, otherwise called the Books of the Old and New Covenants, faithfully translated from Corrected Texts of the Originals, with Various Readings, Explanatory Notes, and Critical Remarks.* In 1793, the second volume was published, carrying the translation as far as the end of the historical books; and in 1800, a third volume was issued, containing his *Critical Remdrks on the Hebrew Scriptures.* The opinions enunciated in these volumes, especially in the last, are startlingly heretical, more especially when the training of their author is considered, and were calculated, at the time of their appearance, to offend both Catholics and Protestants. They exhibit as thorough-going Rationalism as is to be found in Eichhorn or Paulus. Moses is said to be inspired in the same sense as other good men; and in regard to his purpose, it is affirmed that 'he only did what all other ancient legislators had done—required a greater or less degree of implicit obedience to their respective laws, and for that purpose feigned an intercourse with the Deity, to make that obedience more palatable to the credulous multitude.' Miracles are explained away; and the account of the creation in Genesis is described as 'a most beautiful mythos or philosophical fiction, contrived with great wisdom, and dressed up in the garb of real history.' These opinions naturally enough exposed him to the charge of infidelity, and his criticisms were described as 'less scurrilous, perhaps, but not less impious than those of Thomas Paine.' All sorts of ecclesiastics united in their condemnation, and the undoubted effect of their hostility was to crush whatever hopes of literary fame G. may have entertained. He died at London, 26th February 1802. It is now generally admitted, even by those who have no sympathy with his views, that G.'s translation is in the main excellent, and that his remarks are often valuable. His labours have unquestionably advanced the science of Biblical Criticism. Among his other productions may be mentioned a poem on the *Confessional;* the *Battle of B—ng—r, or the Church's Triumph, a comic-heroic poem in nine cantos;* and *Bardomachia, or the Battle of the Bards.*

GEDDES, Janet, known in Scottish ecclesiastical history as 'Jenny Geddes,' has had her name transmitted as the person who took a prominent part in resisting the introduction of the Liturgy or Service-book into the Church of Scotland in 1637. The circumstances were these. Sunday, 23d July 1637, was the day fixed for this innovation, so obnoxious to the Scottish Presbyterians, and an immense crowd filled the High Church of St Giles's, Edinburgh, on the occasion. On the Dean of Edinburgh beginning to read, his voice was lost in a tumultuous shout, and an old woman, said to have been one Jenny G., who kept a green-stall in the High Street, bawling out: 'Villain! dost thou say mass at my lug?' (that is, ear), launched her stool at the dean's head. Universal confusion ensued, and the dean, throwing off his surplice, fled, to save his life. The Bishop of Edinburgh, on attempting to appease the storm, was assailed by a volley of sticks, stones, and other missiles, accompanied by cries and threats that effectually silenced him. This tumult proved the deathblow of the liturgy in Scotland. It has been doubted, however, if there ever was such a person as Jenny Geddes. In 1756, a citizen of Edinburgh, of the name of Robert Mein (who died in 1776), known for his exertions for the improvement of his native city, published a tract called *The Cross Removed, Prelacy and Patronage Disproved*, &c., in which he claims the exploit of Jenny G. for his great-grandmother, 'the worthy Barbara Hamilton, spouse to John Mein, merchant and postmaster in Edinburgh, who, in the year 1637, spoke openly in the church at Edinburgh against Archbishop Laud's new Service-book, at its first reading there, which stopped their proceedings, and dismissed their meeting, so that it never obtained in our church to this day.' In the obituary notice of Robert Mein, *Weekly Magazine*, vol. xxxix., and *Scots Magazine*, vol. xxxvi. (1776), this Barbara Hamilton is said to have been descended from the Hamiltons of Bardowie, 'but was better known in our history by the name of Jenny Geddes, though called so erroneously.' Jenny G.'s famous stool is said to have been burned by herself in the bonfires at the cross of Edinburgh at the Restoration, and what has been called hers in the Museum of the Society of Antiquaries at Edinburgh, has no claim to that name beyond gratuitous conjecture. See *Proceedings of the Society of Antiquaries of Scotland*, vol. iii. part 2, pp. 179, 180.

GEEFS, Guillaume, a Belgian sculptor, was born at Antwerp, on the 10th of September 1806. After studying there for some time, he went to Paris, where he worked in the studio of M. Ramey. During the revolution of 1830, he quitted Paris, and returned to Belgium, and soon after executed at Brussels a monument to the memory of the victims of the revolution of 1830. The most important of his other works are a 'Colossal Marble Statue of King Leopold;' 'Monument to Count Frederic de Merode,' now in the cathedral of Brussels; and 'Statue of General Belliard,' both of whom fell in the revolution. He also executed a group entitled 'Le Lion Amoureux,' which was shewn at the Great Exhibition in Paris (1855).—Geefs, Joseph, younger brother of the preceding, and born in 1808, has also acquired a reputation as a sculptor. He has executed a number of statues, of which two, 'Metabus' and 'Thierry Maertens,' were shewn at the Exhibition in 1855. In general character, his works bear a considerable resemblance to those of his brother.—Geefs, Aloys, youngest brother of the preceding, is also known as a sculptor by means of his 'Epaminondas Dying,' 'Beatrix,' and the bas-reliefs for the 'Rubens' of his eldest brother. He died in 1841.

GEEL, Jakob, a distinguished Dutch scholar, was born at Amsterdam in 1789, and educated at the Athenæum of that city, principally under Van Lennep. After living at the Hague from the year 1811 as a family tutor, he became second librarian at Leyden in 1823, and in 1833 head-librarian and honorary professor. He had made himself meanwhile known as a philologist by editions of Theocritus, with the *Scholia* (1820), of the *Anecdota Hemsterhusiana* (1826), of the *Scholia in Suetonium* of Ruhnken (1828), of the *Excerpta Vaticana* of Polybius (1829); and his *Historia Critica Sophistarum Græcorum* (1823) had called forth several treatises on the same subject from German philologists. In 1840, appeared his edition of the *Olympicus* of Dio Chrysostom, accompanied by a *Commentarius de Reliquis Dionis Orationibus;* and in 1846 he issued the *Phœnissæ* of Euripides, with a commentary, in opposition to Hermann. All these works, which are written in pure and pleasing Latin, are models of thorough scholarship, as well as of taste and method. G. contributed further to the revival of classical learning in the Netherlands by the establishment, along with Bak, Peerlkamp, and Hamaker, of the *Bibliotheca Critica Nova*, in 1825. The national literature is also indebted to him not only for the translation of German and English works into Dutch, but also for original treatises on various æsthetical subjects. He has, moreover, won the gratitude of the learned throughout Europe by his liberality as a librarian, and especially by his valuable *Catalogus Codicum Manuscriptorum, qui inde ab Anno* 1741 *Bibliothecæ Lugduni Batavorum accesserunt* (1852).

GEELO'NG, the second city of Victoria, in Australia, stands at the head of the westerly arm of Port Phillip. It is about 40 miles to the south-west of Melbourne, the capital of the colony, with which it has, since 1855, been connected by a railway, the intermediate space being said to be one of the finest levels for the purpose in the world. Telegraphic communication has also been established with Melbourne, Ballarat, and, since 1857, with the other gold-fields. Though the town is built on the harbour of Corio, yet the cargoes of large ships are discharged into lighters at a distance of six miles. In 1851, were discovered the gold-fields of the neighbourhood. Even before this, G. had become a flourishing place, as one of the principal seats of the wool trade. Between 1846 and 1851, the houses had increased from 257 to 1593, being more than sixfold in five years; while the inhabitants, multiplying in about the same proportion, gave the corresponding results of 1370 and 8291. Again, between 1851 and the beginning of 1854, the population had grown from 8291 to 20,115. Nor had the gold caused the wool to be neglected, of which, in 1853, the exportation amounted to 7,019,900 lbs., as against 9,870,731 sent from Melbourne itself. Before the close of 1860, the annual value of the rateable property was £130,674, yielding an assessment of £17,507, 0*s.* 4*d.*, or about 2*s.* 8*d.* in the pound. During the year last mentioned, the shipping inwards comprised 179 vessels, and 31,285 tons; while, with respect to the shipping outwards, the corresponding returns were 174 and 32,939.

GE'FLÉ, an important town of Sweden, chief town of the læn of the same name, is situated at the mouth of the river Gefle, on an inlet of the Gulf of Bothnia, about 100 miles north-north-west of Stockholm. The stream upon which it stands is divided into three branches, forming two islands, which are united by bridges with the right and left banks of the river, and form portions of the town. G. ranks third among the commercial towns of Sweden; Stockholm and Göteborg alone possessing a more extensive trade. The chief buildings are a gymnasium; a castle, imposingly situated; a court-house, which is considered one of the finest in Sweden; a good public library, and an excellent harbour. G. carries on ship-building to some extent, and has manufactures of sail-cloth, linen, leather, tobacco, and sugar. Its exports are iron, timber, tar, flax, and linen; and its imports chiefly corn and salt. Pop. (1855) 9587.

GEHE'NNA is the Greek form of the Hebrew *Ge-hinnom* ('Valley of Hinnom'), or *Ge-ben-Hinnom* ('Valley of the Son of Hinnom'). This valley, or rather gorge—for it is described as very narrow, with steep and rocky sides—lies south and west of the city of Jerusalem. Here Solomon built a high place for Molech (1 Kings xi. 7), and, in fact, G. would appear to have become a favourite spot with the later Jewish kings for the celebration of idolatrous rites. It was here that Ahaz and Manasseh made their children pass through the fire, 'according to the abomination of the heathen;' and at its south-east extremity, specifically designated Tophet ('place of burning'), the hideous practice of infant sacrifice to the fire-gods was not unknown (Jeremiah vii. 31). When King Josiah came forward as the restorer of the old and pure national faith, he 'defiled' the Valley of Hinnom by covering it with human bones, and after this it appears to have become 'the common cesspool of the city, into which its sewage was conducted, to be carried off by the waters of the Kidron, as well as a laystall, where all its solid filth was collected. Hence, it became a huge nest of insects, whose larvæ or "worms" fattened on the corruption.' It is also said that fires were kept constantly burning here, to consume the bodies of criminals, the carcasses of animals, and whatever other offal might be combustible. Among the later Jews, G. and Tophet came to be regarded as symbols of hell and torment, and in this sense the former word is frequently employed by our Saviour in the New Testament. For example, in Mark ix. 47, 48, he says: 'It is better for thee to enter into the kingdom of God with one eye, than having two eyes, to be cast into hell-fire [Gehenna]; where their worm dieth not, and the fire is not quenched.'

GEIBEL, Emanuel, one of the most popular of the living poets of Germany, was born at Lübeck, on the 18th October 1815. After receiving the rudiments of education at the high school of his native town, he completed his studies at the university of Bonn. In 1836, he went to Berlin, where he became acquainted with Chamisso, Gaudy, and Kugler. Two years afterwards, he obtained a tutorship in the family of the Russian ambassador at Athens, where he continued to prosecute his scientific and poetical studies. On his return to Lübeck in 1840, he worked up the material he had collected in Greece, and became, in addition, a diligent student of Italian and Spanish literature. Soon after the publication of his first poems, a pension of 300 thalers a year was bestowed upon him by the king of Prussia. G. now resided alternately at St Goar on the Rhine with Freiligrath, at Stuttgart, Hanover, Berlin, and Lübeck; till, in the spring of 1852, he was appointed professor of æsthetics in the university of Munich by the king of Bavaria. In conjunction with Curtius, he published his *Classische Studien* (Bonn, 1840), containing translations from the Greek poets. These were followed in the same year by his *Gedichte* (Berlin, 1840, 28th edit. 1852), the melody, artistic beauty, and decidedly religious tone of which, made them at once great favourites with the Germans. The results of his Spanish studies were the *Spanischen Volkslieder und Romanzen* (Berlin, 1843), which were followed by the *Spanische Liederbuch* (Berlin, 1852), published in conjunction with Paul Heyse. In 1857 appeared his tragedy of *Brunehilde.* His poems are distinguished by fervour and truth of feeling, richness of fancy, and a certain pensive melancholy, and have procured him a popularity—especially among cultivated women—such as no poet of Germany has enjoyed since the days of Uhland.

GEIGER, Abraham, rabbi in Breslau, was born at Frankfurt-on-the-Maine, May 24, 1810. According to old rabbinical practice, his teachers were his father and elder brother, till he reached the age of eleven. After that, having received a more regular education for some years, he went, in 1829, to the university of Heidelberg, and shortly afterwards to that of Bonn. While engaged there in the study of philosophy and of the Oriental languages, he gained a prize for an essay on the Jewish sources of the Koran, which at a later period appeared in print under the title, *Was hat Mohammed aus dem Judenthum aufgenommen?* (Bonn, 1833). In November 1832, he was called as rabbi to Wiesbaden, and there, under the impulse to the scientific study of Judaism which proceeded from Berlin, he devoted himself zealously to Jewish theology, especially in its relation to practical life. In 1835, he joined with several able men in editing the *Zeitschrift für Jüdische Theologie.* The spirit of inquiry, however, with which he discussed prevalent opinions and usages, brought him into collision with the conservative Jews, especially after 1838, when he became assessor of the rabbinate at Breslau; but the great majority of educated men in the sect continued attached to him. It was he who gave the first impulse to the celebrated assemblies of the rabbis, three of which have been held since 1844 at Brunswick, Frankfurt-on-the-Maine, and Breslau. At the second of these he was vice-president, and president at the third. Though G. thus took an active part in the reform movement, he could not abandon his historical point of view, which made him unwilling to break entirely with the past; and therefore he refused a call to be preacher to the Berlin Reform Society. Besides sermons, pamphlets, and numerous contributions to the above-mentioned periodical, G. published some historical monographs, which are distinguished by thoroughness of investigation and many-sided learning. Among these may be mentioned the *Melo Chofnajim* (Berlin, 1840), on Joseph Salomo del Medigo, and the *Hite Haamanim* (Berlin, 1847), on the exegetical school of Northern France. His *Lehr- und Lesebuch zur Sprache der Mischna* (1845) also is of great value to the Oriental philologist. In 1850 appeared the first number of *Studien* on Moses-Ben-Maimon; and in 1851, a translation of the *Divan of the Castilian Abu'l-Hassan Juda ha-Levi*, accompanied by a biography of the poet and explanatory remarks. Besides some specimens of Jewish medieval apologetics, contributed to Breslauer's *Jahrbuch* in 1851—1852, G. has more recently published a work on the original text, and the translations of the Bible in their dependence on the development of Judaism (*Urschrift und Uebersetzungen der Bibel in ihrer Abhängigkeit von der inneren Entwickelung des Judenthums*, Breslau, 1857).

GEILER VON KAISERSBERG, Johann, a famous pulpit-orator of Germany, was born at Schaffhausen, 16th March 1455; studied at Freiburg and Basel, where he obtained his degree of D.D.; and in 1478 became preacher in the cathedral of Strasburg, where he died, 10th March 1510. G. ranks among the most learned and original men of his age. His sermons, usually composed in Latin and delivered in German, are marked by great eloquence and earnestness; nor do they disdain the aids of wit, sarcasm, and ridicule. Vivid pictures of life, warmth of feeling, and a bold, even rough morality, are their leading characteristics. In fact, G.'s ethical zeal often urged him to a pungency of satire hardly in keeping with modern views of the dignity of the pulpit, but quite congruous with the taste of his own age. His style is vigorous, free, and lively, and in many respects he may be regarded as a sort of predecessor of Abraham a Sancta-Clara. Of his writings, which have now become very rare, may be mentioned *Narrenschiff* (Lat., Strasb. 1511; Ger. by Pauli, 1520), comprising 412 sermons on Sebastian Brandt's (q. v.) *Narrenschiff; Das Irrig Schaf* (Strasb. 1510); *Der Seelen Paradiess* (Strasb. 1510); *Das Schiff der Pönitenz und Busswirkung* (Augsb. 1511); *Das Buch Granatapfel* (Strasb. 1511); *Christliche Pilgerschaft zum Ewigen Vaterland* (Basel, 1512); *Das Evangelienbuch* (Strasb. 1515); and *Das Buch Von Sünden des Mundes* (Strasb. 1518). Compare Ammon's *G. Von Kaisersberg's Leben, Lehren und Predigten* (Erl. 1826), and Meick's *Joh. G. Von Kaisersberg. Sein Leben und Seine Schriften in einer Auswahl* (3 vols., Fkf. 1829).

GEJER, Eric Gustaf, one of the most distinguished historians of Sweden, was born at Ransätter, in the Swedish læn of Wermland, in 1783. He was sent, at the age of 16, to the university of Upsala; and in 1803 he competed successfully for the prize which was that year awarded by the Academy of Stockholm for the best essay on the life and character of the great Swedish administrator, Sten Sture. This was the turning-point of his life, for from this period he began to devote himself with zealous industry to the study of the history of his native country. His assiduity was rewarded by his speedy nomination to a post in the Chamber of the National Archives, and in 1810 he was elected assistant to Fant, the professor of history in the university of Upsala, and in 1817, on the death of the latter, he succeeded to his chair. G.'s early lectures were listened to with the profoundest interest, both by his students and the public at large, who crowded to his lecture-room; but at a subsequent period of his teaching, his popularity diminished in proportion to the increased profundity of his views; while the suspicion that he harboured sceptical notions in regard to the Trinity, brought him into disfavour with a certain portion of the community. These suspicions led to his denunciation to the university authorities; but the examination to which the charges against him gave rise terminated in his acquittal, and were even followed by the offer of a bishopric, which, however, he declined. G. exercised a marked influence on the poetic no less than the historical literature of Sweden, and according to the testimony of his countrymen, his *Sista Skalden*, *Vikingen*, *Odalbonden*, and other heroic pieces, place him in the foremost rank of Swedish poets. He and his friends Adlerbeth, Tegner, and Nikander, adhered to the 'Gothic' school of poetry, which owed its origin to 'the Society of the Goths,' which they and several of their friends established as early as 1810, when they brought out in connection with it a magazine entitled the *Iduna*, in which first appeared several of G.'s best poems, and among other productions of merit, the early cantos of Tegner's *Frithiof*. Great as is the value of G.'s historical works, he unfortunately did not complete any one of the vast undertakings which he planned. Thus, for instance, of the *Svea Rike's Häfder*, or Records of Sweden, which were to have embraced the history of his native country from mythical ages to the present time, he finished only the introductory volume. His next great work, *Svenska Folkets Historia*, which was intended to form one of the series of European histories, edited by Leo and Uckert, was not carried beyond the death of Queen Christina; yet incomplete as they are, these works rank among the most valuable contributions to Swedish history. To G. was intrusted the task of examining and editing the papers which Gustavus III. had bequeathed to the university of Upsala, with the stipulation that they were not to be opened for fifty years after his death. In fulfilment of his charge, G. arranged these papers in a work, which appeared in 1843 under the title of *Gustaf III.'s efterlemnada Papper*, and which, from the worthless nature of the contents, disappointed the expectations of the nation, who had been led to hope that their publication would reveal state secrets of importance. During the last ten years of his life, G. took an active part in politics; but although his political writings possess great merit, the very versatility of his powers diverted him from applying them methodically to the complete elaboration of any one great object. G. was known to his countrymen as a musician and composer of no mean order. He lived on terms of friendly intercourse with Bernadotte, and his numerous letters to the king form part of the *Samlade Skrifter*, or collective works, which have been published since his death by his son, who has appended to this edition, which was completed in 1853, an interesting biographical sketch of his distinguished father. G. died in 1847.

GELA, in ancient times, a very important town, on the southern coast of Sicily, on the river of the same name. It was founded by a Rhodian and Cretan colony, 690 B. C. Its rapid prosperity may be inferred from the circumstance, that as early as the year 582 B. C., Agrigentum was founded by a colony from Gela. After Cleander had made himself tyrant in the year 505 B. C., the colony reached its highest pitch of power under his brother Hippocrates, who subdued almost the whole of Sicily, with the exception of Syracuse. Gelon, the successor of Hippocrates, pursued the same career of conquest, and Syracuse itself fell into his hands, and was even made his principal residence, G. being committed to the government of his brother Hiero. After many vicissitudes during the Carthaginian wars in Sicily, it ultimately fell into decay. Its ruin was completed by Phintias, tyrant of Agrigentum, who, a little before 280 B. C., removed the inhabitants to a town in the neighbourhood, which he had founded, and to which he gave his own name. Its site is generally believed to be occupied by Terra Nova, at the mouth of the river now known as Fiume di Terranova.

GELATI'GENOUS TISSUES AND GE'LATINE. The gelatigenous tissues are substances resembling the proteine-bodies (albumen, fibrine, and caseine) in containing carbon, hydrogen, nitrogen, oxygen, and sulphur; but differing from them in containing more nitrogen and less carbon and sulphur. They consist of two principal varieties, viz., those which yield gluten (or ordinary *gelatine*) and those which yield *chondrine.*

Gluten is obtained by more or less prolonged boiling with water, from the organic matter of bone (the *osseine* of Frémy), from tendons, skin, cellular tissue, white fibrous tissue, the air-bladder and scales of fishes, calves' feet, hartshorn, &c.; while chondrine is similarly obtained from the permanent cartilages, from bone-cartilage before ossification, from enchondromatous tumours, &c.

Neither gluten nor chondrine appears to exist *as such* in the animal body, but is in all cases the result of the prolonged action of boiling water on the above-named tissues. Frémy's analyses (see his *Recherches Chimiques sur les Os*, in the *Ann. de Chim. et de Phys.*, 1855, vol. xliii., p. 51) shew that osseine is isomeric with the gluten which it yields, and further, that the amount of gluten is precisely the same as that of the osseine which yields it.

The following table exhibits the composition of osseine and the gluten yielded by it as determined by Frémy, and that of chondrine as determined by Mulder:

	Osseine.	Gluten.	Chondrine.
Carbon, ...	49·21	50·40	49·97
Hydrogen, ...	6·50	6·50	6·63
Nitrogen, ...	17·86	17·50	14·14
Oxygen with a little Sulphur,	25·14	26·00	28·97

Gluten, when perfectly pure and dry, is a tough, translucent, nearly colourless substance, devoid of odour and taste. It swells when placed in cold water, and loses its translucency; but in boiling water it dissolves, and forms a viscid fluid, which on cooling forms a jelly. A watery solution containing only 1 per cent. of gluten, gelatinises on cooling. This property is destroyed both by very prolonged boiling and by the action of concentrated acetic acid. Gluten is insoluble in alcohol and in ether.

A solution of gluten is abundantly precipitated by solutions of corrosive sublimate and of bichloride of platinum, as well as by infusion of galls, of which the active principle is tannin or tannic acid (the terms being synonymous). Tannic acid produces, even in very dilute solutions, a copious yellow or buff-coloured precipitate of tannate of gluten. The gelatigenous tissues unite in a similar manner with tannin; they extract it from its watery solutions, and form compounds with it which resist the action of putrefaction. It is thus that hides are converted into Leather (q. v.). The tests which we have mentioned also precipitate albumen, but gluten may be distinguished from albumen by its not being thrown down (as is the case with albumen) by the addition of ferro-cyanide of potassium together with a little acetic acid. The gelatinising property also serves to distinguish gluten when it amounts to 1 per cent. or more of the solution.

On exposure to the atmosphere, gluten becomes more rapidly putrid than almost any other animal substance. Under the influence of oxydising agents, it yields the same products as the proteine-bodies; treated with the mineral acids or with alkalies, it yields Glycocine (q. v.)—known also as glycine, glycocoll, and sugar of gelatine—Leucine (q. v.), and other products.

Isinglass, which is prepared from the air-bladder of the sturgeon, &c., when boiled with water, furnishes gluten in a nearly pure state. Glue and size are two well known forms of impure gluten or gelatine.

Chondrine resembles gluten in its physical properties, and especially in its property of gelatinising. It differs, however, slightly from it in chemical composition (see the above table), and in its behaviour towards reagents. For instance, acetic acid, alum, and the ordinary metallic salts of silver, copper, lead, &c., which produce no apparent effect on a solution of gluten, throw down a precipitate from a solution of chondrine; while, on the other hand, corrosive sublimate, which precipitates gluten freely, merely induces a turbidity in a solution of chondrine.

We do not know much regarding the physiological relations of these substances. Gluten (according to Scherer) usually exists in the juice of the spleen, but in no other part of the healthy animal body; it is sometimes found in the blood in cases of leucocythæmia, in pus, and in the expressed juice of cancerous tumours. Chondrine has been found in pus. The gelatigenous tissues rank low in the scale of organisation, and their uses are almost entirely of a physical character. Thus they form strong points of connection for muscles (the tendons), they moderate shocks by their elasticity (the cartilages), they protect the body from rapid changes of temperature by their bad conducting power (the skin), and they are of service through their transparency (the cornea).

GELATINE, in Technology. This term, although usually applied to only one variety of the substance, obtained by dissolving the soluble portion of the gelatinous tissues of animals, nevertheless properly belongs also to Isinglass and Glue, which are modifications of the same material. Vegetable jelly is also analogous, and will be mentioned under this head.

Gelatine and glue signify the more or less pure and carefully prepared jelly of mammalian animals, but the term isinglass is only applied to certain gelatinous parts of fishes, which from their exceeding richness in gelatine, are usually merely dried and used without any other preparation than that of minute division for the purpose of facilitating their action.

Gelatine (proper) is prepared for commercial purposes from a variety of animal substances, but chiefly from the softer parts of the hides of oxen and calves and the skins of sheep, such as the thin portion which covers the belly, the ears, &c.; also from bones and other parts of animals.

One of the best, if not the best of the varieties of gelatine manufactured in Great Britain, is that made by Messrs Cox of Gorgie, near Edinburgh, which is remarkable for its great purity and strength, or gelatinising power; they call it 'sparkling' gelatine from its beautiful bright transparency, and its purification is effected by certain processes which they have patented. The materials they use are carefully selected portions of ox and calf hides. Another preparation, made by Mr Mackay of Edinburgh (pharmaceutical chemist), is deserving of special mention, as it is prepared with the greatest care from calves'-feet, and is especially adapted for invalids. It is made on a limited scale, and only for a few leading chemists.

The general method adopted with skin-parings or hide-clippings, is first to wash the pieces very carefully; they are then cut into small pieces and placed in a weak solution of caustic soda for a week or ten days, the solution being kept moderately warm by means of steam-pipes. When this process of digestion has been sufficiently carried on, the pieces of skin are then removed into an air-tight chamber lined with cement, and here they are kept for a time, determined according to the skill of the manufacturer and the kind of material employed, at a temperature of 70° F. They are next transferred to revolving cylinders supplied with an abundance of clean cold water, and afterwards are placed still wet in another chamber lined with wood, in which they are bleached and purified by exposure to the fumes of burning sulphur; they next receive their final washing with cold water, which removes the sulphurous acid. The next operation is to squeeze them as dry as possible, and transfer them to the gelatinising pots, which are large earthen vessels, enclosed in wooden cases, made steam-tight. Water is poured in with the pieces, and kept at a high temperature by means of the steam in the cases surrounding the pots.

By this means the gelatine is quite dissolved out of the skin, and is strained off whilst still hot; it is poured out in thin layers, which as soon as they are sufficiently cooled and consolidated, are cut into small plates, usually oblong, and laid on nets, stretched horizontally, to dry. The cross-markings observable on the plates of gelatine, in the shops, are the marks left by the meshes of the nets.

Another process, introduced by Mr Swineburne, consists in treating pieces of calf-skin by water alone, without the soda and sulphur processes; the pieces, after simple washing, being transferred at once to the pots to be acted upon by the steam; undoubtedly, this is the purest, but the expense of preparing it prevents its general use. Inferior gelatine is made from bones and other parts of animals, and it was stated by an eminent authority, that in Paris the enormous number of rats which are occasionally killed in the sewers and abattoirs, after being deprived of their skins, which are reserved for other purposes, are all used by the gelatine-makers. These materials are placed in cages of wire, which are placed in steam-tight boxes, where they are submitted to the direct action of steam of 223° F., but at a low pressure; and cold water, supplied by another pipe through the upper part of the box, is allowed to flow slowly and percolate through the contents of the cage, the water and condensed steam descend to the bottom charged with gelatine, and are drawn off by a stopcock placed there for the purpose.

The French manufacturers succeed better than any others in clarifying these inferior gelatines, and they rarely make any others; they run their plates out very thin, which gives them greater transparency and apparent freedom from colour; and they colour them with most brilliant colours, and form very fine-rolled sheets, tempting the eye with an appearance of great delicacy and purity, which would at once disappear if the material were made up into the thicker plates of the British manufacturers.

The purity of gelatine may be very easily tested; thus: pour upon dry gelatine a small quantity of boiling water, if pure it will form a thickish gluey colourless solution, free from smell; but if made of impure materials, it will give off a very offensive odour, and have a yellow gluey consistency. No article manufactured requires such careful selection of material and such nice and cleanly manipulation to insure a good marketable character; and those anxious for purity should avoid all artificially coloured varieties, however temptingly got up, unless they are required for merely decorative purposes and not for food. For the value of gelatine as food, see Diet.

Isinglass (supposed to be derived from the German *Hausenblase*, bladder of the sturgeon), the *Ichthyocolla* (*ichthus*, a fish; *kolla*, glue) of the classical and scientific writers, was formerly obtained only from the common sturgeon (*accipenser sturio*), and consisted of the dried air-bladder of the animal. The necessities of modern commerce have, however, led to the discovery, that the same part in many other fishes forms good isinglass; and instead of Russia, as formerly, being almost the only producing country, we have now large quantities from South America, chiefly imported from Maranham, some from the East Indies, the Hudson's Bay Territory, New York, and, owing to Professor Owen calling the attention of the Canadian Commissioners of the Exhibition of 1851 to the subject, it is now brought in considerable quantities and of excellent quality from Canada, where it is likely to prove a source of profitable industry.

The commercial varieties of this material are numerous, and a thorough knowledge of them can only be obtained by considerable personal acquaintance with them; therefore, their names only are given, with those of the producing animals:

Russia—		
Long Staple Ural,*	1st quality.	Accipenser Guldenstadtii.
" " "	2d "	
Short Staple Patriarch.		
Book Patriarch,	1st "	
" "	2d "	
Thin leaf Patriarch,	1st "	
" "	2d "	
Belugo, .	1st "	Accipenser Huso.
" . .	2d "	
The brown soiled and ragged ends called *Pickings.*		
Sisane, leaf, .	?	
Kroski, or Krosky, .	?	
Samovey, leaf, .	1st quality.	Silurus Glanis (?)
" "	2d "	
" staple,		
" book,	1st "	
" "	2d "	
Siberian, Purse, . .		Accipenser Sturio (?)
South America—		
Brazilian, Pipe, . . .		Probably a species of Pimelodus.
" Lamp, . .		Probably a species of Silurus.
" Honey-comb,		
East Indies—		
East Indian, Purse, . .		Probably a species of Polynemus.
" " Leaf, . .		
North America—		
Hudson's Bay, Purse,		Accipenser.
New York, Ribbon, .		Gadus Merluccius.
Canadian, leaf, .		Accipenser Sturio.

Besides these now well-known commercial varieties, others are occasionally met with, as the *Manilla*, in thin cakes; the *Para*, which is the most remarkable of all, resembling grapes of a reddish-brown colour, growing from a straight thick stem; these are the dried ova of the *Sudis gigas*, a large fish common in the mouths of the Amazon. An inferior kind is also made of cod-sounds and sole-skins, sufficiently good, however, to be used in fining beer and other liquids.

One of the qualities of gelatine is its power to form chemical combinations with certain organic matters; hence, when it is mixed and dissolved in a fluid containing such matters, it combines, and the compound is precipitated. It would appear that this combination, however, is threadlike in its arrangement, and that the crossing threads form a fine net-work through the fluid, which, in falling, carries down all floating substances, which, by their presence, render the liquid cloudy; hence its great value in clarifying beer and other liquids. For this reason isinglass, which has been found the best gelatine for the purpose, is very largely consumed by brewers.

Isinglass, strictly speaking, is not gelatine, but its only value is from the excessive proportion of gelatine held in the tissues of the organ which yields it, greatly enhanced by the ease with which it is abstracted from the membrane when compared with the complicated process necessary for separating and purifying the gelatine from the skins, &c., of other animals. When separated, however, the substances are identical in composition, and, if pure, are undistinguishable from each other.

Besides the substances mentioned as yielding gelatine, formerly hartshorn shavings were used, and ivory turnings and saw-dust are still employed, both, however, chiefly for dietetic purposes for invalids; and various kinds of animal food are valued for the abundance of gelatine they contain, as the Trepang and Beche de Mer (species of Holothuria), sharks' fins, fish-maws, ray-skins, elephant hide, rhinoceros hide, and the softer parts, all of which are luxuries amongst the Chinese, Japanese, Siamese, Malays, &c. Turtle-shells, or the upper and lower parts of the shield (*carapace* and *plastron*), constitute the callipash and callipee of the epicure, and form, in the hands of the experienced cook, a rich gelatinous soup. The fleshy parts of the turtle, calves' head and feet, and many other things, might be enumerated as valuable, chiefly in consequence of their richness in this material.

Glue differs only from *gelatine* in the care taken in its manufacture, and in the selection of the materials from which it is made; almost every animal substance will yield it, hence all kinds of animal refuse finds their way to the glue-makers' boilers. Nevertheless, the impossibility of preserving, for any length of time, the materials required for this manufacture, renders it necessary to adopt some system in choosing and preserving them, until sufficient quantities are collected, without fermentation or decomposition. Hence the refuse of tanneries, consisting of the clippings of hides, hoofs, ear and tail pieces of ox, calf, and sheep are preferred, because they can be dressed with lime, which removes the hair, and acts as an antiseptic. For this purpose, they are placed in tanks with quicklime and water for two or three weeks, during which the lime is several times renewed, and the pieces frequently turned over. They are afterwards washed and dried, and are ready for use by the glue-maker, who usually gives them another slight lime-dressing, and subsequently washes them; they are afterwards exposed to the action of the air for a time, to neutralise the caustic lime. When well-drained, the pieces are placed in flat-bottomed copper-boilers, which have a perforated false bottom placed a little distance above the true one, to prevent the burning of the materials, and which have been supplied with rain or other soft water up to two-thirds the depth of the boiler, the pieces being piled up to some height above the top of the open boiler. The whole is kept at a gentle boiling heat until all the gelatinous part has dissolved out, and the mass of material has sunk down into the fluid. The boiling is sustained until, by repeated trials of small quantities, the operator knows the fluid is of the right consistency, when it is drawn off carefully into the congealing boxes, and fresh materials are added to the residue left behind in the boiler, and the process is repeated.

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* So called from the bladder being purposely bent into the form of a *staple* in drying.

The congealing boxes are of wood, and are nearly square, being slightly narrower at the bottom than the top; they are filled to the brim, and when their contents are sufficiently solidified, the glue, with a little management, turns out in the form of a cube, which is cut into thin slices by a wire in the same manner as soap; and these larger slices are subdivided into smaller cakes by a wet knife. Frames, with nets stretched upon them, are provided for drying the cakes upon; and these frames, when covered with the cakes of glue, are adjusted one over another at a little distance apart, supported between four uprights, and if in the open air, covered over with little wooden roofs, the whole being arranged so that the air can have free access to facilitate drying. This process is an anxious one to the manufacturer, as the changes of the weather have great and often completely destructive effects upon glue in this state; and in this country only the spring and the autumn can be relied upon with any satisfaction. Generally, after the open air drying, the glue is taken to drying-rooms heated slightly, where it hardens effectually; but it is not yet finished; the cakes at this stage have a dull, unsightly look, to remedy which they are dipped into cold water, or are wetted with a brush dipped in hot water, and re-dried, this wetting giving the cakes a bright varnished appearance. Great Britain does not excel in the manufacture of glue, and British workmen usually prefer the dark variety. Very superior glue is made by the Dutch and Germans, by whom the light and more carefully made varieties are most prized, the adhesive qualities being lessened exactly in proportion to the impurities present in the material.

Besides its use in joinery, cabinet-making, and similar operations, glue is used by paper-makers and in dressing silks; and for these last two purposes fine light-coloured kinds in thin cakes are made. Large quantities are employed also by paper-hangers and others for sizing walls in the state called *size*, which is the glue simply gelatinised after boiling in the first process. A very fine and pure white *size* is made by the bonnet-makers of Bedfordshire and other places of the skins of calves' head, ears, and the under part of the neck and belly: this is used for stiffening straw, cotton, horse-hair, and other plaits for making bonnets and hats.

VEGETABLE JELLY, which is analogous to animal gelatine, is obtained largely from some fruits, but never in a pure state; it is only of value in preserving such parts of the fruit for culinary purposes; but several of the sea-weeds yield a large quantity of very pure jelly, which, in some instances, is applied to important purposes: thus, the jelly of *fucus spinosus*, the agar-agar, or agal-agal, abundant on the shores of the eastern seas, is used by the East Indians, Cingalese, and Chinese for dressing their silks; the Chinese also ingeniously form thin films of the jelly over a framework of bamboo, and thus make small windows for their houses. This, and another, *Gracillaria lichenöides*, are formed into a thick jelly, with sugar and other materials, and eaten as a delicacy; and both are supposed to supply the material for those wonderful birds'-nests, which constitute the most costly luxury known to the art of cooking. Another jelly-yielding sea-weed is found on our own shores, called the Irish Moss or Carrigeen (*Chondrus Crispus*), which is often made into jellies for invalids, and the plant itself, on account of its richness in this material, is very extensively employed in feeding cattle, especially in England.

GE'LDERLAND, a province of Holland, is situated between the Zuider Zee on the north-west, and the Prussian dominions on the south-east. It has an area of 1948 square miles, and in 1860 a population of 405,490. It is watered chiefly by the Yssel, the Rhine, the Waal, and the Maas. The surface is in general flat, but northward from Arnheim, the capital, and over the whole of the north-west portion of the province, stretch sandy hills, frequently covered with bushes. The climate is healthy, and the soil, on the whole, good, though much of it is still in heath and marsh. Along the river valleys a rich loamy soil is found. Agriculture is prosecuted with great success. Wheat, rye, buckwheat, tobacco, &c., are abundantly produced. Among the manufactures, paper and leather are the principal. Chief towns, Arnheim, Nimeguen, and Zutphen.

GELI'DIUM, a genus of *Algæ* (sea-weeds), of the sub-order *Ceramiaceæ*, some of the species of which are believed to afford the material used by certain species of swallow in building the edible nests so much prized by the Chinese. See NESTS, EDIBLE. Several species of gelidium are used as food in the east. Like many other sea-weeds of this order, they are almost entirely gelatinous, and when boiled with condiments to give pungency and flavour, form a very wholesome and agreeable food.

GELL, SIR WILLIAM, knight, an eminent antiquarian and classical scholar, the younger son of Philip Gell, Esq. of Hopton, Derbyshire, was born in 1777. He was educated at Jesus College, Cambridge, where he graduated as B.A. in 1798, and M.A. in 1804, and was for sometime a fellow of Emmanuel College in that university. He devoted his time principally to antiquarian research and geographical studies, and published the following learned and valuable works: *The Topography of Troy* (1804, folio); *The Geography and Antiquities of Ithaca* (1808, 4to); *The Itinerary of Greece* (1810, 4to); *The Itinerary of the Morea* (1817, 8vo); *Attica* (1817, folio); *Pompeiiana, or Observations upon the Topography, Edifices, and Ornaments of Pompeii*—in conjunction with J. P. Gandy, Esq., an interesting and beautiful work, which first brought his name into notice (2 vols. 8vo, 1817—1819; second series, 2 vols. 8vo, 1832); *Narrative of a Journey in the Morea* (1823, 8vo); *The Topography of Rome and its Vicinity* (1834, 8vo); *Rome and its Environs* (Map, 1834). In August 1814, on the departure to the continent of Caroline, Princess of Wales, consort of George IV., she appointed him as one of her chamberlains. In that capacity he attended her in various parts of Italy, but being attacked with the gout, was soon obliged to resign his situation. In 1820, he was examined as a witness at the bar of the House of Lords during the proceedings against her majesty after she became queen, and had returned to England. Subsequently, he resided in Italy, principally at Naples, having a house also at Rome, where he occasionally took up his abode. He died at Naples, February 4, 1836, and was interred in the English burial-ground of that city.

GE'LLERT, CHRISTIAN FÜRCHTEGOTT, a German poet and moralist, was born July 4, 1715, at Haynichen, in the Erzgebirge, in Saxony, entered the university of Leipsic in 1734, where he devoted himself mainly to the study of theology. After some years spent as a tutor, and as a teacher in a public academy, he obtained a professorship in the same university in 1751. His lectures on poetry, rhetoric, and morals were numerously attended, and were greatly admired. He died 13th December

1769. G. was a man of spotless virtue, but rather effeminate in mind and character. He wrote fables, stories, didactic poems, spiritual odes and songs. His most popular writings were his fables and stories. They are marked by ease and naturalness of manner. His spiritual odes owe their continued popularity to their deep piety, and to a certain vigour and loftiness of flight not to be found in his other poems. G. is to be considered one of the pioneers of modern German literature. He marks, along with others, the transition from the dulness and pedantry of the previous generation of authors, to that rich and superabundant life which Goethe and Schiller poured into the national literature. G.'s collective works (*Sämmtliche Werke*) first appeared at Leipsic in 10 vols. (1769—1774), and have passed through various editions; the most recent is that published in the same city (6 vols., 1840—1841). Compare *Gellert's Leben*, by J. A. Cramer (Leip. 1774), and by Döring (2 vols., Leip. 1833).

GEL'LIUS, Aulus, a Latin author, who seems to have lived about 117—180 A.D. The exact date, either of his birth or death, is not known. He is supposed to have been born at Rome, where, at all events, he studied rhetoric. Subsequently, he proceeded to Athens to undergo a discipline in philosophy. On his return to Rome, he entered upon a legal career, without, however, abandoning his literary pursuits. G.'s well-known work, the Attic Nights (*Noctes Atticæ*), begun during the long nights of winter in a country-house near Athens, and completed during the latter years of his life, is a collection of miscellaneous matter on language, antiquities, history, and literature, in 20 books, of which the 8th is wanting. It contains many extracts from Greek and Latin authors no longer extant. The work is destitute of any plan or arrangement, is disfigured by archaisms, and derives its value mainly from being a repertory of curious knowledge. The *Editio Princeps* appeared at Rome in 1469; the most critical edition is that of Jak. Gronovius (Lug. Bat. 1706); a more recent but much less valuable one is that of Lion (2 vols., Göttingen, 1824—1825). G. has been translated into English by Beloe (Lond. 1795); into French by the Abbé de Verteuil (Paris, 1776); and (in part) into German by Von Walterstern (Lemgo, 1785).

GELON, 'tyrant' of Gela and Syracuse, was the son of Deinomenes, and was a native of the former city. His family was one of the oldest and most distinguished in the place. G. himself first figures in history as one of the body-guards in the service of Hippocrates, tyrant of Gela. On the death of the latter, he contrived to obtain the supreme power (491 B.C.), and about 485 B.C., he made himself master of Syracuse also, which then became the seat of his government, and to which he transferred the majority of the inhabitants of Gela. His influence soon extended itself over the half of Sicily. G. refused to aid the Greeks against Xerxes, as they declined to comply with his demand that he should be appointed commander-in-chief. About the same time, Terillus, ruler of Himera, in Sicily, invoked the aid of the Carthaginians against Theron of Agrigentum, who had dispossessed him of his state. G., who was in alliance with Theron, hastened to the assistance of the latter, and on the same day (according to tradition) on which the Greeks won the battle of Salamis, he gained a complete victory over the invaders at Himera. The consequence was an immediate treaty of peace between him and the Carthaginians, who were compelled to pay all the expenses of the war. His clemency and the wisdom of his measures rendered him so generally beloved, that when he appeared unarmed in an assembly of the people, and declared himself ready to resign his power, he was unanimously hailed as the deliverer and sovereign of Syracuse. The story current in later times, that one of the conditions on which he granted peace to the Carthaginians was, that their human sacrifices should be abolished, has probably no historical foundation, but it illustrates the general belief in the humanity of his character. G. died 478 B.C. The people, who, contrary to his desire, had erected a splendid monument to his memory, paid him honours as a hero, and at a later period, when all the brazen statues were sold under Timoleon, his statue was made an exception to the general rule. He was succeeded by his brother Hiero.

GEM, a term often used to signify a precious stone of small size, such as may be used for setting in a ring, or for any similar purpose of ornament; but sometimes by mineralogists in a sense which they have themselves arbitrarily affixed to it, for the purpose of scientific classification, as the designation of an *order* or *family* of minerals, generally hard enough to scratch quartz, insoluble in acids, infusible before the blow-pipe, without metallic lustre, but mostly brilliant and beautiful. Among them are included some of the minerals, which, in popular language, are most generally known as gems—ruby, sapphire, spinel, topaz, beryl, emerald, tourmaline, hyacinth, zircon, &c.—and some other rarer minerals of similar character; but along with these are ranked minerals, often coarser varieties of the same species, which are not *gems* in the ordinary sense of the word, as emery and common corundum, whilst diamond and some other precious stones, much used as gems, are excluded. See Gems.

GEMA'RA (Ghemâra, a Chaldee word, signifying complement) is that portion of the two Talmuds which contains the annotations, discussions, and amplifications of the Mishnah by the academies of Palestine on the one hand, and those of Babylon on the other. The Babylonian Gemâra, more complete as well as more lucid than the Palestinensian, possesses a much more highly valued authority. The final redaction of this latter falls in the middle of the 4th c. A.D., while the former was not completed till 500 A.D. See Mishnah and Talmud.

GE'MINI (the Twins), the third constellation in the zodiac, named from its two brightest stars, Castor, of the first magnitude, and Pollux, of the second.

GEMI'STUS, Giorgios, called Giorgios Plethon, and more commonly Gemistus Plethon, was the last of the Byzantine writers. The exact dates of his birth and death are uncertain, but he is known to have lived between 1350 and 1450. He was probably born at Constantinople, but the greater part of his life was passed in the Peloponnesus. He was one of the deputies sent by the Greek church to the council which was held at Florence in 1438, for the purpose of arranging a union between the Latin and Greek churches. The council, however, entirely failed in its purpose. G. was more celebrated as a philosopher than as a theologian. In his time, the Aristotelian philosophy reigned supreme, but it had degenerated into a mere science of words, from the study of which G. turned away disgusted, and applied himself to Plato. Plato's philosophy so charmed him, that thenceforward he devoted himself to its propagation; and in furtherance of this view, G., when in Italy, induced Cosmo de Medici to embrace it. Cosmo's example was followed by others in Florence, and thus a Platonic school was founded in the west which flourished for nearly 100 years afterwards. During the latter part of his life, G. was engaged in bitter conflict with the most eminent of the Aristotelians, among whom George of Trebizond held a high position, and between him and G. the discussion was carried on with most unseemly violence. G. is last heard of in history in 1441, when we find him in the Peloponnesus in an official capacity. G. wrote a great number of works in history, philosophy, theology, &c.

GEMMA'TION, or GEMMI'PAROUS GENERATION. See Reproduction.

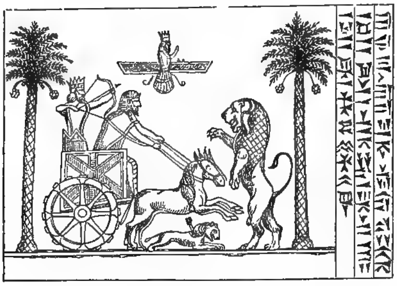
GEMO'TE. Besides the great council of the nation—the *Witena-gemot*, or, as we more usually spell it, Witenagemôte (q. v.)—which corresponded to the Reichstage of the Franks, and which, though it took the place of the still more ancient meetings of the whole nation, to which Tacitus refers as characteristic institutions of the Teutonic tribes in his day, was a representative, though not perhaps an elective body (Kemble's *Saxons in England*, ii. p. 194), there were amongst the Anglo-Saxons various minor motes or moots, which did not partake of the representative character. The existence of these is an instance of the manner in which the spirit of localisation has always maintained its ground, and balanced that of centralisation amongst the Germanic nations, and more particularly in England. There was the *shire-gemot*, or county court, which met twice a year; and the *burg-gemot*, which met thrice; the *hundred-gemot* (see Hundred), which met every month, and an extraordinary meeting of which was held twice a year; the hallegemote, or *court-buron*. These institutions excluded not only central despotism, but local tyranny in the shape of individual caprice. The ealdorman decided only with the assent of the shire-gemote, just as the king was dependent upon that of the Witan. Lappenberg by Thorpe, ii. p. 322.

GEMS, Ancient. The term *gem*, which is applied to jewels and other valuable and precious stones, means in archæology engraved stones of the precious kinds, and even small engraved portions of hard and primitive rocks which have been set or worn as jewels by the ancients. Before entering, however, upon the subject of engraved stones, it will be necessary to mention the principal kinds which are mentioned by ancient authors, or have been found by modern researches to have been used for engraving.

Although the principal varieties of precious stones were known to the ancients, yet owing to the absence of scientific and chemical analysis, they appear to have distinguished precious, and other stones, only by colour, specific gravity, and density. The different nomenclature, too, used by different authors, multiplied synonyms, and caused confusion; so that it has become impossible to identify all the stones mentioned by Theophrastus, Pliny, and others. As a general rule, the ancients did not engrave such precious stones as the diamond, ruby, and sapphire, being content with those of less hardness and value. The principal stones used by engravers were: (1) The carnelian, and its more transparent variety the sard, *sardion*, in common use in the days of Plato (so called from Sardes in Lydia, but chiefly obtained from India and Babylonia): (2) The chalcedony, supposed to be the ancient calchedonion, used for seals and reliefs, of which two kinds have been found: (3) The *onyx* or nail-stone, variously described by Pliny and his predecessors, but distinguished by a white layer resembling the nail: (4) The nicolo or *Ægyptilla*, obtained from the onyx, a blue spot with a black zone encircling it: (5) The *sardonyx*, which was a variety of the onyx, having black, blue, white, and red colours, and particularly used for cameos and vases, by cutting down the lighter coloured layers to the darkest for a background to the figures, a stone much prized by the ancients; the signet of Scipio Africanus the Elder being of this material, and the Emperor Claudius esteeming it and the emerald above all other gems: (6) The agate or *achates*, so named from a Sicilian river, embraced many varieties, as the jaspachates, dendryachates, but confounded with the jasper, considered a charm against scorpions and spiders, used for whetstones, and a talisman by athletes; it was obtained from Egypt, Greece, and Asia: (7) Plasma or the *Prasius*, root of emerald, much used under the lower empire; its varieties were the *Molochates* and *Nilion:* (8) Numerous varieties of the jasper, *iaspis*, green, blood-red, yellow, black, mottled or porcelain, and even blue, were employed for signets at the Roman period, and procured from India, Persia, and Cappadocia. Pliny mentions a remarkable statuette of Nero, weighing 15 ounces in this material: (9) Garnets, the *granatici* or red hyacinths of antiquity, which were principally in use at the latter days of the Roman empire, and amongst the Oriental nations—with which may be classed: (10) The *carbunculus*, supposed, however, by some to be the name given by the ancients to the ruby, was brought from India, Garamantia, Carchedon, and Anthemusia: (11) The *hyacinthus* or jacinth, a yellow variety of the garnet, which was used for signets, and came from Ethiopia and Arabia: (12) The *Lyncurium*, or *Lychnis*, which is the ancient name of the true modern jacinth: (13) Several varieties of the emerald or *smaragdus* are cited by the ancients, as the Bactrian or Scythian, supposed to be a green ruby, principally derived from the emerald mines at Zabora, in the neighbourhood of Coptos, worked by conscripts, and described by Agatharcides. Many remarkable stories are told of this gem, which has only been found with engravings of a later period; one sent by a king of Babylon to a king of Egypt was 4 cubits long and 3 in width; an obelisk in the temple of Jupiter, 40 cubits high, is said to have been made out of four emeralds; and Theophrastus mentions an emerald column of great size in the temple of Hercules at Tyre. In the Egyptian labyrinths, according to Apion, was a colossal Serapis of great height, made of emerald. This stone was used by gem-engravers to 'refresh' the sight, or inlaid in the eyes of statues, as in the Lion at Cyprus, erected to Hermias; it was set in the ring of Polycrates; and used as a lens by Nero to behold the fights of the gladiators in the circus: (14) The Beryl or *Beryllus*, obtained from India, cut in shape of a hexagonal pyramid, was used at an early period for engraving: (15) The amethyst, brought from Arabia Petræa and Armenia Minor, is found used for intagli at all periods: (16) The *sapphirus* of the ancients, supposed by some to be *lapis lazuli*, came from Media, and appears in use amongst the Egyptians and Persians: (17) The *anthrax*, supposed to be the ruby, was not engraved; the hyacinthus has also been conjectured to be the blue sapphire: (18) The topaz, *topazon*, applied by the ancients to a green stone found by the Troglodytes in the island of Cytis, in the Arabian Gulf, and first sent by Philemon to Berenice, out of which also a statue of Arsinoe was made and placed in the so-called 'golden temple' by Ptolemy Philadelphus: (19) The *Chrysolithus:* (20) Chrysoprase, turquoise *callais:* (21) The *magnes* or loadstone, were used for cylinders and gems of a late period: (22) The green tourmaline, or avanturine, *sandaresus:* (23) The obsidian, *obsidianus*, so-called after its founder Obsidius, four elephants made of which were dedicated by Augustus in the temple of Concord were also known; and a statue of Menelaus, made of the same material, was returned to the Heliopolitans by Tiberius: (24) The *opal opalites*, or *pæderos*, obtained from India, the largest of which then known, of the size of a hazel-nut, belonging to the senator Nonius, was valued at about £2000, which he would not yield to M. Antony; this stone was sometimes engraved: (25) The *adamas*, of which seven varieties were known to the ancients, was only used for cutting other gems, or worn rough, but was not engraved, or even faced, the art of polishing it having been discovered by Louis de Berghem in the 15th century. The list of Pliny, indeed, contains many other stones, which have been either confounded with those already described—their names having been derived from different sources—or else they are species of the same. Many of these had fanciful names, as (26) the *Aromatites* of Arabia and Egypt, so-called from its fragrance: (27) The *alectorius*, worn by the wrestler Milo, so-called from being taken out of the gizzard of a fowl: (28) The aspilates, a fiery stone, said by Democritus to be found in the nest of Arabian birds. In the selection of stones for engraving, the gem-engravers adapted the material to the subject —Bacchanalian subjects were often engraved on amethysts; marine, on beryls; martial, on carnelians, sards, and red jaspers; rural, on green jasper; celestial, on chalcedonies. Superstitious virtues were also attributed to the different varieties of gems—thus the amethyst was supposed to protect from the influence of wine; and according to Dioscorides, the jasper was particularly adapted for amulets; and Alexander of Tralles recommends the subject of Hercules engraved on a Median stone, to be worn on the finger as a remedy against the cholic.

Green Jasper Abraxas, with figure of Iao.

The art of engraving precious stones at the earlier periods of the Egyptian monarchy was comparatively unknown, although these people made beads of carnelian, felspar, root of emerald, jaspers, lapis lazuli, amethyst, and other hard stones. For the purposes of seals, however, and for intagli, steatite scarabæi were generally used, and engraved gems are either of the greatest rarity or suspected, till the time of the Ptolemies. A remarkable exception to this rule is a square signet of yellow jasper, engraved with the name and titles of Amenophis II. (about 1450 B.C.) and his horse, in the British Museum. Under the Ptolemies and Romans, the Gnostic gems, called Abraxas, generally of lapis lazuli, blood-stone, and jasper, begin to appear, but these are made by the same process as the Greek, from which they were derived. The Ethiopians, according to Herodotus, engraved signets. The same may be said of the neighbouring Phœnicia, which either imitated the cylinders of the Babylonians, or the scarabæi of the Etruscans. In Assyria, the oldest gems are of cylindrical shape, from one to two inches long, and half an inch thick, pierced through their long axis for a cord to attach round the wrist. The earlier ones are of serpentine, the later of the time of Sargon or Shalmaneser, of agate, jasper, quartz, and syenite, engraved with figures of the gods, and the names of their possessors in cuneiform. The inscriptions, indeed, are often difficult to read, but names similar to those of Assyrian and Babylonian monarchs occur, one cylinder having a name like that of Nebuchadnezzar. The Babylonian are of the same type, and chiefly of hæmatite, loadstone, steatite, and jasper; have also figures of deities, and the names of deities or the possessors, generally executed in a coarse rude style by the graver. Oval gems, indeed, appear, from the impressions on the clay tablets, to have been in use at the same time; that of cylinders passed to the Persians, under whom the art became much better, and chance has preserved the cylinder signet of Darius I., found in Egypt.



Chalcedony Cylinder: Signet of Darius I.

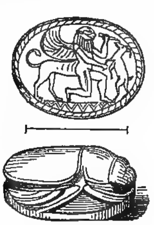
These cylinders were abandoned for conical gems, principally of chalcedony, engraved on the base with figures of deities, in use prior to the conquest of Alexander, and were at a later period, commencing in the 3d c. A.D., followed by hemispherical agate gems, with heads, animals, and Pehlevi inscriptions, generally of a rude and debased style of art. These, again, at a later period, were succeeded by convex stones *en cabochon*, often garnets, sards, carbuncles, engraved on the upper surface, with rude figures of animals, heads and other devices also, accompanied with Pehlevi inscriptions, and these probably continued till the rise of Mohammedanism in the East, when the art was confined to the engraving of cufic legends on the most valuable of oriental stones, often with a great degree of dexterity. In Judea, the use of signets (see SEALS) prevailed, and the most important known instance is the Urim and Thummim, or breastplate of the high-priest, consisting of twelve precious stones, engraved with the names of the twelve tribes; but no Hebrew engraved stones earlier than the 5th or 6th century are known. Amongst the other oriental nations of antiquity, the Bactrians and early Hindus seem to have exercised the art of engraving on stones, although no works of great merit of these nations have been found, and those of a later age are mere seals engraved with sentences of the Koran, or the names of the possessors, and when smeared with black or coloured inks, were impressed on documents as stamps. Of the other nations of antiquity, the Chinese only have had seals (see SEALS) of crystal, soapstone, porcelain, and other substances, with devices in relief for using as stamps, the subjects being mottoes from poetical and other works.

The Greeks, at the earliest period, are not supposed to have employed engraved stones for their signets, the earliest rings being of solid metal, such as the legendary ring of Minos; but at a later period, those of Helen, Ulysses, and the legendary one of Gyges, are said to have had engraved stones. Orestes, in the tragedies, is also recognised as the son of Agamemnon by his engraved ring; and Mnesarchos, the father of Pythagoras, who lived about 700 B.C., was an engraver of gems. The earliest instance of an engraved gem is the emerald ring of Polycrates, set in gold or engraved by Theodorus of

Samos about 740 B.C.; while the laws of Solon against counterfeiting signets shew that they may have been in early use. At the period of the Persian war they were by no means uncommon. Later, the writings of the Platonists and Stoics constantly allude to gems, and the flute-player Ismenias, 437 B.C., purchased an emerald engraved with a figure of Amymone. Still later, the poet Eupolis instances the extravagant prices given by the Cyrenæans for engraved stones in rings. Yet it is doubtful if any real Greek intagli earlier than the war of Peloponnesus can be identified, those hitherto cited in low relief, enclosed in a guilloche or engrailed border, and of a hard and stiff style of art, having been probably cut from the bases of scarabæi of Etruscan work. At a later period, their use was universal, and the names of celebrated engravers, such as Pyrgoteles and Apollonides, are known, the first named having the privilege of engraving the portrait of the monarch, Alexander the Great: Ptolemy V., presented as a most precious gift his portrait engraved on an emerald to Lucullus; and Cleopatra had a gem with Bacchus. The style of engraving of this age is fine and noble, the hair indicated by fine wiry lines; the subjects are generally heroic, but busts and portraits of divine, regal, and historical personages appear. Sards, amethysts, and jacinths were in use.

Greek Sard, with Indian Bacchus.

Contemporaneous with the Greek school, if not earlier, was the Etruscan, consisting of scarabs entirely carved out of sard, carnelian, agate, with engraving often of exquisite work, but generally harsh, and sometimes of severe style, with subjects derived from the earliest Hellenic myths, and occasional inscriptions in the Etruscan language, the names of the personages represented, seldom more than one figure appearing on the gem. The subject is surrounded with a guilloche or engrailed border, and the scarabs were pierced through their long axis, to set as rings or to wear as other objects of attire. Similar scarabs, but of green jasper, and of Phœnician workmanship, have been found in Sardinia. These gems probably were made from the beginning to the middle of the 3d c. B.C., when Etruria fell into the power of the Romans, who derived their engraved stones from the Greek successors of Alexander, as engraved rings, with their subjects, are mentioned at the close of the republic, the device of Scipio Africanus being a head of Scyphax; that of Sylla, the submission of Jugurtha; of Pompey, a lion carrying a sword; and of Cæsar, Venus armed with a dart. So great had the passion for these charming little works of art increased, that Scaurus, the step-son of Sylla, had even a collection of gems, *dactyliotheca*. Pompey sent the collection of Mithridates as an offering to the Capitol; and Cæsar, to outvie his great competitor, presented six such collections to the shrine of Venus Genetrix; and Marcellus another to the cella of the Palatine Apollo. At the commencement of the Empire, the portraits follow the costume and art of the period; the hair is expressed by broad strokes, the compositions rarely contain more than two figures. Artists of great merit, as Dioscorides, Apollonides, and Chronios flourished at this age.



Carnelian Etruscan Scarabæus: Centaur and Deer.

The names of the artists who engraved the gems, and of the proprietors, are occasionally found upon them. The devices were various: Augustus had first a sphinx, then his portrait engraved by Dioscorides; Nero, Apollo and the Muses; Galba used first a dog, subsequently the head of Augustus. After the Antonines, indeed, the art rapidly declined, and portraits after Severus are rare, although even that of Mauricius is said to occur. At the middle period of the Empire, the work is exceedingly rude, often merely scratched out by a diamond point in carnelians, jaspers, and garnets. Some works, indeed, of the later or Byzantine period exist, but they are of poor merit and execution, and the subjects are taken from Christian subjects. The gems of this later period are sometimes square, generally, however, the long or convex oval. The *camei*, or gems in relief, the ancient *ectypa sculptura*, appear at the period of the Roman Empire. This term *camei*, of uncertain origin, is applied to engravings on stones of two or more layers, such as the onyx or sardonyx, and niccolo, and is different from the relief-gems cut out of stones of one colour. Ancient camei, indeed, are of the greatest rarity, and are not older than the imperial days of Rome. The smaller ones were used for rings; the larger, which are often perforated, are supposed to have been worn in the armour or dress, *phaleræ*. They were worked out with the diamond point; chiseled, so to say, out of the stone; and have, when examined, a rough appearance. The most remarkable ancient camei known are those of the Vienna collection, supposed to represent the apotheosis of Augustus, on which are Augustus, Jupiter, and Rome enthroned, the Earth, Ocean, Abundance, Germanicus, Victory, a triumphal car, Tiberius, and German captives; another, in the same collection, with Ptolemy II. and Arsinoe, the great cameo in the Bibliotheque at Paris, representing the apotheosis of Augustus; another in the collection of the Netherlands; and a fourth in the Vatican; a cameo at St Petersburg, one foot long, and another, eight and a half inches wide by six inches high, in the Marlborough collection, with the heads of Didius Julian and Manlia Scantilla. At a later period, the art had considerably declined, and the Christians of the later days of the Empire were content with engraving inscriptions on camei. These gems were principally worn as objects of attire, and Heliogabulus is said to have placed even intagli in his shoes. The names of artists are rarely found upon camei; a celebrated one of the Marlborough collection, indeed, has the name of Tryphon, but there is considerable doubt about the authenticity of the inscription.

Sard Portrait of Caligula.

The subjects of ancient gems embrace the whole circle of ancient art, and follow the laws of its development, animal forms being succeeded by those of deities and subjects derived from the battles of Greeks and Amazons and Centaurs, the exploits of Hercules, and other heroes; then by scenes from tragedians and later myths; and, finally, by portraits, historical representations, and allegories. The inscriptions consist of the names of deities, heroes, and subjects; dedications to deities; the names of artists, sometimes in the genitive case, but often accompanied with the verb *epoei*, 'was making' (the affected imperfect used after the time of Alexander the Great); addresses to individuals; gnomic or other sayings, indicating that the gems are amulets against demons, thieves, and various evils; or charms for procuring love; the names of the possessors, and sometimes addresses, occasionally even distichs of poetry, and various mottoes. These inscriptions were often added by subsequent possessors, and are not of the age of the gem itself. The number of artists, although very considerable, does not exceed 100 authentic names; and the true names are supposed to be distinguished from false ones by being placed at the side of the composition in very small letters terminating in dots; but even these have been successfully imitated by modern artists, and the greatest criticism and learning have been displayed to detect real ancient names by their orthography and palæography. The number of false antique stones produced by eminent engravers since the revival of the arts, has rendered the diagnosis of gems so difficult, that no branch of archæology requires greater judgment. All gems of high artistic merit and great finish are suspected, especially those with groups of many figures, regular edges, and polished faces, or too great a polish in the deep parts. Coarser imitations have been produced by backing pastes or coloured glass (see GEMS, IMITATION) with stones, and mounting them in rings, so as to pass for a gem. The appearance of wear and friction has been produced by introducing them for awhile into the gizzards of turkeys, or in pierced boxes plunged in the beds of rivers. The judgment upon gems can be, however, only matured by a careful study and familiarity with all branches of ancient art. The coarser imitations of pastes, the tongue, the file, and the graver will detect; but old gems re-engraved, or new compositions invented, require the most careful survey. The place or circumstance of discovery is only a feeble guarantee against deception, the commerce in false antiques being successfully plied upon the unwary even in the far East.

The chief implement used by the ancient engravers appears to have been made by splitting diamonds into splints (*adamantis crustæ*) by a heavy hammer, and then fixing these points like glaziers' diamonds into iron instruments, with which the work was executed by the hand (*ferra retusa*). The drill, *terebra*, was also extensively used for hollowing out the deeper and larger parts of the work, and emery powder, the *smaris* or Naxian stone, for polishing. The so-called wheel, a minute disk of copper, secured to the end of a spindle, and moistened with emery powder or diamond dust, and driven by a lathe, does not appear to have come into use till the Byzantine epoch. It has been conjectured that the artist used lenses of some kind, or globes filled with water, to execute his minute work; but the ancient, like the modern engraver, rather felt than saw his way. All these processes were not employed by the same artist, for besides the engraver (*scalptor cavarius, dactyliographus*), there was a polisher (*politor*), not to mention arrangers (*compositores gemmarum*), and merchants (*gemmarii, mangones gemmarum*) who drove a flourishing trade in emeralds and pearls and engraved stones in the days of Horace.

The general fall of the arts at the period of the Byzantine Empire, seems to have been accompanied by the decline of the art of engraving on gems; and the Merovingian and Carlovingian monarchs were obliged to use antique gems, instead of those engraved by the artists of their day. Rock-crystals, however, were engraved in a Byzantine style of art, with sacred subjects, in the 9th c.; but the art was all but lost till the rise of Lorenzo de Medici, when Giovanni delle Corniole at Florence, and Domenico dei Camei at Milan, worked under his patronage. A subsequent school of gem-engravers originated with Pietro Maria de Pescia, who worked for Leo X.; the chief representatives of the school are Michelino, Matteo de Benedetti, the celebrated painters Francia, M. A. Moretti, Caradosso of Milan, Severo of Ravenna, Leonardo da Vinci, J. Tagliacarne, Bernardi of Castel Bolognese, who died 1555, celebrated for a Tityus copied from M. Angelo. These were succeeded by Matteo del Nassaro of Verona, who worked for Francis I., and produced a crucifixion on heliotrope, so that the red spots seemed drops of blood issuing from the wounds of Christ; Caraglio, who flourished in Poland in 1569; Valerio dei Belli, who chiefly employed rock-crystal; Marmita, Domenico di Polo, Nanni, Anichini of Ferrara, and Alessandro Cesari, celebrated for a cameo head of Phocion; Dei Rossi, a Milanese, engraved the largest cameo of modern times; Jacomo da Trezzo, celebrated for his portrait, is said to have been the first to engrave on the diamond in 1564—an honour disputed, however, by Birago, another Milanese, both artists having been in the service of Philip II. of Spain, who made a portrait of Don Carlos and the arms of Spain on this gem.

The art, which had declined at the close of the 16th c. in Italy, flourished in the 17th c. in Germany under Rudolph II., for whom Lehmann engraved at Vienna; and in France, where Coldoré worked for Henri IV. and Louis XIII. In the 17th c., Sirletti, who died at Rome in 1737, excelled in portraits, and copied antique statues with great excellence. The two Costanzi are celebrated in 1790, one for the head of Nero on a diamond. Rega of Naples is said to have come nearest to the antique. Natter of Nuremberg, who died in 1763, is celebrated for his intagli; Guay and Barier were celebrated in the French school; and the English produced Reisen, who died 1725; Claus, who died 1739; Smart, celebrated for the rapidity of his works; and his pupil Seaton, a Scotchman, who engraved portraits of the great men of his day. The greatest artist of the age, however, was Natter. Of the subsequent Italian school, Ghinghi, Girometti, Cerbara, Bernini, and Putenati are much praised. The 19th c. produced many good English engravers, as Marchant, Burch, Wray, and Tassie; while Pistrucci, celebrated for his charming cameo, Weigall, and Saulini, who made intagli, complete the list of modern gem-engravers.

With respect to ancient gems in the dark and middle ages, they were preserved in shrines, châsses, and other ecclesiastical vessels in which they were set, the passion for collecting them as works of art having commenced with Lorenzo de Medici, who formed the Florentine collection, and had his name incised on his gems. The large camei of the European collections, however, appear to have been brought by the Crusaders from the East. The French collection dates from Charles IX., and was augmented by the successive kings of France; it is very rich in gems of all kinds; that of Berlin containing the united cabinets of the Elector of Brandenburg and the Markgraf of Anspach, collected by Stosch, consists of nearly 5000 stones. The Vienna collection, far less numerous, is remarkable for its large camei. In England, the collection of the British Museum, collected originally by Townley, Hamilton, Payne, Knight, and Cracherode, consists of about 500 stones, some of great beauty and merit, but is very poor in camei. The private collection of the Duke of Devonshire, formed in the last half century, comprises upwards of 500 intagli and camei, including some of the finest known. The Marlborough, still more numerous, comprises many fine camei and intagli, and numerous works of the renaissance. The Pulzky collection, now in Italy, contains many rare and choice intagli. A celebrated collection, the Poniatowsky, formed upon the base of the old collection of Stanislaus, last king of Poland, was so filled with forgeries by its last possessor, executed by Roman artists with inscriptions by Diez, that it entirely lost its value on dispersion. The Hertz collection, the last great one sold, was remarkably rich in fine Etruscan scarabæi and other intagli. There are probably about 10,000 gems reputed to be antique. Yet these are only a mere instalment of those formerly existing. The immense value placed by the ancients on their gems, may be seen by the scabbard of Mithridates, valued at 400 talents, or £7572; the pearl given by Julius Cæsar to Servilia, worth £4800; that swallowed by Cleopatra, valued at £5000; and the pearls and emeralds worn by Lollia Paulina, wife of Caligula, valued at £320,000—all the spoils of provinces and the heirlooms of her family. These, indeed, were probably not engraved, but in modern times great sums have been paid to celebrated engravers, as much as £800 for one cameo.

Although the acquisition of gems is too costly for private individuals, impressions in glass, called pastes (see Glass), in sulphur, gutta percha, or plaster of Paris, can be easily obtained, and they answer almost all the purposes of study. Some ancient impressions in terra cotta, indeed, exist, and the poorer classes of Greece and Rome were content with glass pastes. The value of antique gems, owing to the great difficulty of discerning those really so, has considerably declined in this country, and even their authority is very cautiously cited by archæologists. The principal writers of antiquity who treated of gems are, Onomacritus or the Pseudo-Orpheus, Dionysius Periegetes, Theophrastus, and Pliny, whose chapter is compiled from antecedent Greek and Roman authors. Isidorus, 630 A.D., gives an account of the principal stones; so do Psellus and Marbodus in the 11th c.; Mariette, *Pierres Gravées* (4to, Paris, 1750); Raspe, *Catalogue des Empruntes des Pierres Gravées* (4to, Lond. 1757); Millin, *Introduction à l'Etude des Pierres Gravées* (12mo, Paris, 1796); Krause, *Pyrgoteles* (8vo, Halle, 1856); Koehler, *Ueber die Geschnittene Steine* (8vo, St Petersb. 1851); King, *Antique Gems* (8vo, Lond. 1860).

GEMS, Artificial. Ever since the chemical composition of our most valued gems—the diamond, ruby, opal, &c.—has been known, attempts have been made, with more or less success, to reconstruct them in the laboratory by the influence of intense heat, electrical action, &c. Amongst the most successful workers in this field, we may mention Ebelmen,* Despretz, Sainte-Claire Déville, and Becquerel.

There are at present no reasons for believing that diamonds of any appreciable size will be formed artificially; Despretz has, however, succeeded, by intense voltaic action, in obtaining minute, dark-coloured crystals of carbon.

Boron, which was discovered simultaneously in 1807 by Davy in England, and by Gay-Lussac and Thénard in France, was first exhibited in a crystallised form by Wöhler and Sainte-Claire Déville. They have not, however, succeeded in obtaining perfectly pure crystals. The different tints which they exhibit are due to the presence of small quantities of carbon in a crystalline state (the same condition in which it occurs in the diamond) and of aluminium. It is not impossible that in the discovery of crystallised boron, we may have advanced a step towards the artificial production of the diamond. The boron crystals possess a brilliancy, hardness, and refractive power scarcely inferior to those of the diamond.

Sainte-Claire Déville and Caron have published a very important Memoir in the *Comptes Rendus* (1858, vol. xlvi.), in which they describe various processes by which they have succeeded in obtaining small crystals of white and green corundum, rubies, sapphires, &c. By the action of the vapours of fluoride of aluminium and boracic acid on one another, they obtained crystallised alumina (corundum) in large, but thin crystals, some of which were about ·4 of an inch in length, and which in their hardness, and in all their optical and crystallographic properties, resembled natural corundum. When a little fluoride of chromium was added, a similar process yielded violet-red rubies of a perfectly natural tint; with rather more fluoride of chromium, blue sapphires were yielded; and with still more of this ingredient, green corundum was obtained, presenting the natural tint of the variety known as ouvaroffite. A mixture of equal equivalents of the fluorides of aluminium and glucinum, when similarly acted on by boracic acid, yielded crystals of chrysoberyl or cynophane, which, although very minute, were perfect in their form, and in all respects resembled the natural crystals. The action of fluoride of silicium on zirconia yields small crystals of zircon or hyacinth (Zr_2O_3,SiO_3); and by the action of silicic acid on a mixture of the fluorides of aluminium and glucinum, hexagonal plates of extreme hardness were obtained, which in some respects resembled emerald (which they were attempting to form), but were not identical in composition with that gem.

The latest researches on this subject are those of Becquerel in the *Comptes Rendus* (1861, vol. liii. p. 1196). After having for many years tried to obtain gems from solutions of silicates, and by feeble electric currents, he now uses intense currents, with high tension, and in this way has succeeded in obtaining opals, &c.

GEMS, Imitation, or Pastes, *Pierres Précieuses Artificielles*, French imitations of the precious stones, are made of glass specially prepared. It differs from ordinary glass in its greater density; at the same time it is made with the greatest possible amount of transparency and purity. Its composition, generally, may be said to be silica of very pure quality, probably quartz crystals, potash, and oxide of lead; but the exact proportions are varied almost by every maker, and each has a secret ingredient or two to add.

The colours employed are usually the same as those used for colouring ordinary ornamental glass, but upon their careful admixture, and upon the skilful cutting to represent the crystalline form of the real gem, the success of the manufacture chiefly depends. By some persons, the cutting is carried to such a marvellous perfection, that their work would deceive the eye of most ordinary judges, when well set and *foiled*, or backed with silver or tinfoil. See Foil.

The glass used for artificial gems is very generally called *strass*, from the name of a German who claimed the invention. But if we seek the real inventor of factitious gems, we must go far beyond the time of Strass, for we find Pliny describing, under the name of *gemmæ vitreæ*, certain imitations of precious stones which were known in his time, some of which were certainly made of coloured glass, and others by ingeniously cementing together layers of variously coloured transparent stones. And Seneca (Epist. ix.) mentions that one Democritus had invented a process for imitating emeralds by giving a green colour to rock-crystal. Other allusions are plentifully scattered through the works of classical authors; and ancient artificial gems themselves exist, two especially famous being imitations of a chrysolite and an emerald, amongst the Roman antiquities in the Museum Victorium at Rome.

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* Ebelmen's memoirs on this department of chemistry are contained in the first volume of Salvetat's *Recueil des Travaux Scientifiques de M. Ebelmen.* Paris, 1855.

The manufacture of factitious gems is chiefly carried on in Switzerland, and like the polishing of diamonds in Holland, is engrossed by a small community in the French commune of Septmoncel, on the Jura Alps, 16 miles from Geneva. Upwards of a hundred artisans are there employed in this manufacture, and they make almost enough to supply the whole world. Much common coloured glass is cut up in this country for the purpose of making the gilt-toy jewellery, but the writer believes that a small manufacturer of the name of Weston, in Birmingham, is the only person who attempts fine imitations of precious stones with coloured strass. The following are a few known formulas for imitating gems: *Amethyst*—Strass, 500 parts; oxide of manganese, 3 parts; and oxide of cobalt, 2 parts. *Diamond*—Perfectly pure rock-crystal, 1600 parts; biborate of soda, 560 parts; very pure carbonate of lead, 3200 parts; oxide of manganese, 1 part. A glass, consisting only of the oxide of tin, fused, is used for the so-called Parisian diamonds; they are the nearest in brilliancy to the real gem when newly made, but they soon lose their brilliancy. *Emerald*—Strass, 7000 parts; carbonate of copper, 65 parts; glass of antimony, 7 parts. *Garnet, Oriental*—Strass, 1200 parts; glass of antimony, 580 parts; Purple of Cassius, 3 parts; binoxide of manganese, 3 parts. *Ruby*—Strass, 45 parts; binoxide of manganese, 1 part. *Sapphire*—Strass, 3600 parts; oxide of cobalt, 50 parts; oxide of manganese, 11 parts. *Topaz*—Strass, 1050 parts; glass of antimony, 44 parts; Purple of Cassius, 1 part.

GEMS-BOC (*Antilope Oryx*, or *Oryx Gazella*), a species of antelope, described by some naturalists as the Oryx, but which, being a native of South Africa only, cannot be the Oryx (q. v.) of the ancients, although it is certainly a nearly allied species. It is a heavy, stout animal, about the size of a stag, with rough reversed hair on the neck and along the ridge of the back; large pointed ears; and almost perfectly straight horns, fully two feet long, in the plane of the forehead, little diverging, and obscurely ringed at the base. The colours are harshly contrasted, dark rusty gray above, and white on the under parts, separated by a broad dark brown or black band; the head white, with black transverse bands; the thighs black, and the legs white. The hoofs are remarkably long, adapted to the rocky mountainous districts which the animal frequents. The G.-B. makes such use of its horns as sometimes even to beat off the lion. It inhabits districts free from wood, and is generally found in pairs or in very small herds.

Gems-boc (*Antilope Oryx*).

GE'MSHORN, a well-known organ-stop in German organs, the pipes of which are made of tin, and are conically shaped, being much narrower at the open end; while at the mouth, at the broad end, there are ears on each to regulate the tuning. It has a peculiarly pleasant tone, of a different character from either an open cylinder pipe or a stopped pipe. The pitch of the gemshorn is generally 8 feet tone, sometimes it is 4 feet, and in the pedal organ 16 feet.

GENDARMES (Men-at-arms), originally, and up to the time of the first French revolution, the most distinguished cavalry corps in the service of the Bourbon kings, to whom they formed a sort of body-guard. Under existing arrangements, the gendarmes constitute a military police, and comprise both cavalry and infantry. The force consists principally of soldiers taken from the army, generally on account of intelligence and good conduct. The men receive much higher pay than the rest of the army, of which, however, the corps is a part, and they are liable in cases of emergency to be sent on active service. The gendarmes now amount to about 25,000 men, and are intrusted with the execution of many of the most delicate details of government.

GENDER (Fr. *gendre*, from Lat. *genus*, *generis*, race, kind), in Grammar, is a distinction among words depending upon sex. Names applied to the male sex are said to be of the *masculine* gender, as *man*, *poet;* those applied to the female sex, *feminine*, as *woman*, *poetess;* words that are neither masculine nor feminine are, as it was expressed in Latin, *neutrius generis*, 'of neither gender;' and from this phrase grammarians have come to speak, somewhat incorrectly, of this class of words as being 'of the neuter gender,' and hence to reckon three genders. In English, the distinction of gender in nouns is chiefly marked in the pronouns substituted for them—*he*, *she*, *it*. Gender, strictly speaking, is applicable only to living beings distinguishable as male and female; but by the figure of speech called Personification (q. v.), inanimate objects are often spoken of as *he* and *she*. In the infancy of language, however, when every word was what we should now call a metaphor—when every thing that moved or was seen to produce any effect, was conceived as actuated by a conscious will, like that which the spectator felt within himself—every prominent or interesting object in the universe would be invested with one or the other sex, according to the analogy it suggested. In Latin, accordingly, *gladius*, a sword, was considered masculine; *navis*, a ship, as feminine; and *pomum*, a fruit or apple, was thought of as without sex. Similarly, in Sanscrit and Greek, the greater part of inanimate objects are either masculine or feminine, the others being neuter. In Hebrew, everything is either masculine or feminine, there being no neuter; and this is the case in the modern languages derived from the Latin, viz., Italian, French, Spanish, and Portuguese—everything is either a *he* or a *she*. German resembles the classic languages in making some inanimate objects masculine, some feminine, and others neuter. Thus at table, a man must speak of the spoon (*der löffel*) as 'he,' of the fork (*die gabel*) as 'she,' and of the knife (*das messer*) as 'it.' English—in this more rational than any of its congeners—has banished the spurious distinctions of gender that encumbered the Anglo-Saxon like the other Teutonic tongues, and attributes sex only to living beings.

In the highly inflected languages, there are certain terminations distinctive of the different genders. It is probable, indeed, that originally every noun, substantive, or adjective, had a suffix indicative of the sex, real or imaginary, of the object designated, although, like other Inflexions (q. v.), these suffixes of gender were in process of time mutilated beyond recognition, or in many cases altogether worn off. The terminations most characteristic of the three genders in Latin are mas. *us;* fem. *a;* neut. *um;* corresponding to the Greek *os*, *ē*, *on*. In a great majority of the adjectives in both those languages, the genders are thus marked. In English, the gender of a noun affects only the personal pronoun substituted for it; in most other languages, the adjectives (including the articles) have different forms for the several genders—a useless complication, in the case of modern languages at least. See ADJECTIVE.

Of the terminations distinctive of gender observable in modern English, some are purely Latin, as in *executor*, *executrix;* the feminine *-ess*, as in *countess*, is borrowed from the French, and is also of classical origin. The prevalent feminine termination in German is *-inn*, as in *tänzerinn*, a female dancer (Fr. *danseuse*); of this there are two instances in English, in the provincial *carlin*, the fem. of *carl*, and *vixen* = Ger. *füchsinn*, a female fox. This affix was already in use in Latin, as in *regina*, a queen (*reg*(*s*), a king); and in this form it is used in Europe generally to femininise proper names; e. g., *Georgina*, *Wilhelmina*, *Caroline*.

In such pairs as *son—daughter; man—maid; horse—mare; cock—hen;* there is no etymological relation between the words; they are from distinct roots. But with regard to *hen*, e. g., the Anglo-Saxon had the two forms, *han* for the male, and *hen* for the female; and *mare* was originally applicable to both sexes, as *horse* still is (Fr. *maréchal*, originally an officer who had charge of the horses). The oldest known form of the Teutonic speech, the Gothic, had the two words, *magus*, son, and *magaths*, daughter, both from the root *mag*, to beget, or to make. *Magaths* has become in Ger. *magd*, in Eng. *maid; magus* has been lost in the Teutonic tongues, but it is represented by the Celtic *mac* (son), evidently from the same root. *King*, *queen*, were in Sans. *ganika*, father, and *goni*, mother, both from the root *gan*, to generate, produce. The masculine form appears in Old Ger. as *chunig*, in modern Ger. *könig*, in Eng. *king;* the feminine became the Greek *gynē*, a woman, as well as the Saxon *cwen*, Sw. *quinna*, Old Eng. *quene* or *quean*, applied to a woman generally, and the modern, *queen*, the chief woman of the land.

GENEA'LOGY (Lat. and Gr. *genealogia;* from Gr. *genos*, race, and *logos*, discourse) is the name applied to the science of the origin, sequence, and affinities of families. Although in itself it is not of sufficient importance to rank as an independent science, yet in so far as it has to do with remarkable and influential families, it forms a very important part of history. It naturally divides itself into two parts, *theoretical* and *practical*. The former embraces the principles on which the science of genealogy is based, while the latter is occupied with tracing the course of particular families themselves. To render perceptible to the senses the descent and relationship of individuals, genealogical tables are made use of, whose arrangement depends on the special purpose for which they are constructed. Usually, however, such tables begin with the earliest ancestor (Ger. *stammvater*) of a family, from whom all the known members of both sexes are traced in the order of descent. The importance of this branch of human knowledge, however, is perhaps less obvious in a scientific than in a legal aspect, where it is concerned about the various claims or pretensions of persons based on real or alleged relationship, more especially in regard to rights of succession. The earliest traces of genealogy are to be found in the ancestral catalogues of the heroes of the old world. Among the Hebrews, there were parties specially appointed to draw up genealogical tables. The progress of civilisation in states, and in particular the institution of corporations and guilds in the towns, afforded a wider scope for genealogy. But the absence of criticism, and the desire to flatter the great, were the causes of introducing—especially after the 14th c.—the most ridiculous fables into genealogy. Ancestors were fabricated in the most impudently false manner, and families carried back in an unbroken line, not only to the age of Charlemagne, but even, in many cases, to the heroes of the Trojan war. The fact, however, is, that scarcely any family, however distinguished, can trace its ancestors even to the middle of the 11th c. Among the earlier works on genealogy are Ruxner's *Turnierbuch* (Simmern, 1527) and the genealogical tables of Reusner and Hennings, about the end of the 16th c., but these are not conceived in a historical spirit. A more luminous treatment of the subject was initiated in France by Duchesne, St Marthe, Hozier, Chifflet, Lancelot le Blond, &c., and in England by Dugdale. Rittershusius of Altdorf (died 1670) and Spener of Wittenberg (died 1730) were the first in Germany to base genealogy on documentary evidence. The path entered on by them has been prosecuted by König, Von Imhof, and especially by Hübner in his *Genealogischen Tabellen* (4 vols., Leip. 1725—1733; new edit., 1737—1766), to which Lenz added *Erläuterungen* (Elucidations, Leip. 1756), and Sophia queen of Denmark, *Supplement-tafeln* (Kopenh. 1822—1824). Gatterer, in his *Abriss der Genealogie* (Gött. 1788), founded the scientific treatment of the subject, in which he was followed by Putter in his *Tabulæ Genealogicæ*, by Koch in his *Tables Généalogiques des Maisons Souveraines d'Europe* (Ger. Berlin, 1808), and by Voigtel in his *Genealogischen Tabellen* (1810).

In Great Britain, the chief printed collections of genealogical information are the *Peerages*, *Baronages*, *Baronetages*, and *County Histories*. The chief manuscript sources are the public records, heraldic registers, and the parish registers of births, marriages, and deaths.

GENERAL (of religious order), in the Roman Catholic Church, the supreme head, under the pope, of the aggregated communities throughout Christendom belonging to a religious order. The governing authorities of the monastic orders in the Roman Catholic Church may be arranged in three classes: (1.) The superiors of individual convents or communities, called in different orders by the various names of abbot, prior, rector, guardian, &c.; (2.) The provincials, who have authority over all the convents of an entire province—the provinces, in the monastic sense of the word, being usually coincident as to local limits with the several kingdoms in which the order is established; (3.) The general to whom not only each member of the order, but all the various officials of every rank, are absolutely subject. The general is usually elected commonly by the general chapter of the order, which, in the majority of orders, consists properly of the provincials; with whom, however, are commonly associated the heads of the more important monasteries, as also the superiors of certain subdivisions of provinces. The office of general in most orders is held for three years. In that of the Jesuits it is for life; but in all, the election of the general chapter must be confirmed by the pope. In most orders, too, there is assigned to the general a consultor (*admonitor*) or associate (*socius*), who, however, is only entitled to advise, but has no authority to control the superior. The general also is supposed to consult with and to receive reports from the various local superiors. He sends, if necessary, a visitor to inquire into particular abuses, or to report upon such controversies as may arise, and he holds a general chapter of the order at stated times, which differ according to the usage of the several orders. The general is exempt from episcopal jurisdiction, being subject to the immediate jurisdiction of the pope himself. He resides in Rome, where he enjoys certain privileges, the most important of which is the right to sit and vote with the bishops in a general council of the church.

GENERAL AGENT. See Agent, Principal and Agent.

GENERAL ASSEMBLY. See Assembly, General.

GENERAL COUNCIL. See Privy Council.

GENERAL DEMU'RRER, in English pleading, was a Demurrer (q. v.) without shewing special cause. Where the objection to the pleading was for want of form, a special demurrer was necessary; but where the defect was in substance, a general demurrer was sufficient. By the Common Law Procedure Act (1852), special demurrers have been abolished, and the distinction has ceased to exist.

GENERAL ISSUE, in English pleading, is the form in which the defendant traverses or meets with a simple denial the whole allegations, or the principal fact on which the plaintiff relies in his declaration. Thus, in actions founded on wrongs, the general issue is 'Not Guilty;' in actions of debt, that the defendant never was indebted; in actions on a deed or bond, *non est factum*, i. e., that it is not the deed of the defendant. Under this issue, the defendant may prove that he never executed the deed; but not that it is bad in point of law. In *criminal proceedings*, the general issue is 'Not Guilty,' by which plea, without further form, every person, not having the privilege of peerage, upon being arraigned upon any indictment for treason, felony, or piracy, is deemed to have put himself upon the country for trial. Where a prisoner refuses to plead, a plea of Not Guilty may be entered for him, 7 and 8 Geo. IV. c. 28. Under the plea of Not Guilty, the prisoner is entitled to give in evidence not only everything which negatives the charge, but also all matter of excuse or justification.

GENERAL LIEN, in English Law, is the right which a party has to retain a chattel as security for the payment, not only of the particular article, but of any balance that may be due on general account in the same line of business. General liens do not exist at common law, but depend upon agreement, either express or implied, or upon the usage of trade. Thus, attorneys have a lien for the balance of their accounts over the papers of their clients. Bankers, factors, warehousemen, and others, have also a lien for the amount due to them on the general balance of their accounts. But it has been held that fullers are not entitled to this privilege, Rose *v.* Hart, 8 Taunt. 499. The right of wharfingers also is not clear in all cases, Holderness *v.* Collinson, 7 Barn. and Cres. 212. In regard to carriers, there has been much dispute whether, by the usage of trade, they have a general lien over goods intrusted to them; but the prevailing opinion appears to be that they have. The master of a ship has no lien on the vessel or her freight for his disbursements on her account; but now he has the same lien for his wages as a seaman has; 17 and 18 Vict. c. 104, s. 191. By 6 Geo. IV. c. 94, it is provided that any person in whose name goods are shipped shall be deemed to be the owner so far as to entitle the consignee to a lien for any advances made for the use of such persons, provided the consignees had no notice when the advance was made that they were not the true owners. As a lien rests upon the right to retain possession, it is lost by abandonment of the possession of the goods.

In Scotland a similar right exists, under the title of Retention (q. v.). See also Lien, and Hypothec.

GENERAL OFFICER is an officer of the general staff of an army to whom is intrusted the command of a body of men, not less in strength than a Brigade (q. v.). In an army of very large proportions, the normal sequence of command would be the following: the general commanding-in-chief, generalissimo, or field-marshal, would command the whole force; the generals would have separate *corps-d'armée;* the lieutenant-generals, wings of those *corps-d'armée;* the major-generals, divisions in the wings; and brigadier-generals, brigades in the divisions. In practice, however, an army is rarely large enough to allow of this exact scheme of a military hierarchy being strictly carried out.

In the British service, colonels become major-generals (except in cases of selection for very distinguished service) in order of seniority, provided each has served on full pay for a certain number of years; promotion to be lieutenant-generals and generals follows in exact order of seniority. From the last, promotion to the exceptional rank of field-marshal is conferred in rare instances by the special favour of the sovereign, who represents in person the sole command and possesses the patronage of all the land forces. In addition to the colonels who become effective generals, officers who have retired on half-pay at earlier periods of their careers rise by seniority to the rank of general officers; but they continue, notwithstanding, to receive only the half-pay of the rank in which they retired. With regard to remuneration, general officers hold 164 honorary colonelcies of regiments, worth, with few exceptions, £1000 each per annum, and the remainder receive *unattached* pay of £600 a year, if they have been in the guards; £1, 6*s.* 3*d.* a day, if in the artillery or engineers; and £1, 5*s.* a day, if previously in the line. This pay is received during non-activity, but when employed actively a general receives, in addition, £5, 13*s.* 9*d.* a day; a lieutenant-general, £3, 15*s.* 10*d.*; and a major-general, £1, 17*s.* 11*d.*, besides various allowances. The only generals' commands in the British service are, during peace, the commands-in-chief of the army generally and of the force in India. According to the estimates for 1862—1863, there are 8 lieutenant-generals, 29 major-generals, and 10 brigadier-generals employed actively, exclusive of the numbers serving with the army in India. The last-named rank is only a temporary one in the English service, conferred very commonly on the senior regimental officer of the corps composing the brigade: during duty as brigadier he receives £1, 8*s.* 6*d.* a day in addition to regimental or other pay. *Captain-general* is a rank very rarely conferred by the sovereign, who holds it *ex officio*. There has been no captain-general, other than the sovereign, during the present century.

GENERAL SHIP, is a ship which has been advertised by the owners to take goods from a particular port at a particular time, and which is not under any special contract to particular merchants. The owners, in this case, engage separately with each merchant who applies to them to convey his goods to the ship's destination. The contract between the owners, or the master acting in their behalf, and the proprietors of the goods, may in the case of general ship be established by parole evidence, and, indeed, there is rarely any other writing on the subject beyond the advertisement and the bill of lading. In general ship the master being intrusted by the owners with full power to contract for and take in goods, no agreement for freight which any one may have made with the owners, independently of him, will be effectual to secure room in the vessel. All such agreements must be intimated to the master, or those acting for him on board, before he has engaged freight for the whole vessel. By such intimation, a preference will be secured over the merchant who brings his goods to the ship's side on chance. If the owners of a general ship have advertised her as bound, for a particular port, they must give specific notice to every person who may ship goods on board, of any alteration in her destination, and they will be liable for the consequences of neglecting to do so. Bell's *Com.* i. 433, Shaw's edition; Abbot on *Shipping*, p. 233.

GENERAL VERDICT. See VERDICT, JURY.

GENERALISATION. Our experience of the world leads us to recognise not only great variety, but also numerous instances of agreement in the midst of the variety. We do not call the continuance of the same fact an agreement; it is only when, amid difference of accompaniment, we recognise a common feature, that our attention is awakened, and our mind interested. Sometimes the common feature in a number of varying objects is obvious and universally noticed; as when we identify the round form amidst all disparities of size, colour, and substance. At other times, the resemblance is so obscured by the amount of difference, that it has lain for ages unperceived; the fall of a stone was never suspected, before the time of Newton, to have anything in common with the motions of the moon and planets. When we see the same property or effect repeated under great variety of circumstances and adjuncts, and when we indicate by a name or otherwise that this agreement exists, we are said to mark out a *general* or generalised property, or fact; while the individual instances are termed the *particulars*, on which the other is grounded.

To understand the full meaning of generalisation, and the questions therewith connected, we must advert to the distinction between two modes of the operation. In the one, we generalise an individual or isolated property—as roundness, whiteness, weight, attraction, justice—and assign what we think the exact nature of the common feature thus singled out. A number of designations have been given to this process, according to the particular stage in the operation most specially taken into view; these are Classification, General Notion, General Term, Definition, Abstraction, Concept or Conception, Idea. They all suppose that we have a plurality of objects with agreeing properties, and that agreement has been taken notice of, and embodied in such a form, that the mind can deal with it to the neglect of the points wherein the particular things differ among themselves. They suppose, further, that we make no affirmation beyond what is implied in the identifying of so many differing objects—namely, that they do agree in the point in question. No other matter for belief or disbelief is presented in the notion of roundness but that certain things have been compared, and have been found to agree in possessing that attribute. To attempt to form a general notion, or to mark a property not attaching to anything in nature, is a pure irrelevance and absurdity; and although by a bold stretch of imagination we might people the earth with chimerical objects, and find agreements among them, yet such generalities could not be introduced into any process of reasoning; it is presumed, that wherever a general property is specified, there are things in nature having this property in company with the others that make up the total characteristics of each.

But the other kind of generalisation introduces belief in a totally different shape. When instead of identifying a property, we identify a union or *conjunction* of distinct properties, it has to be seen not merely whether the common features are correctly rendered in the general notion, but whether the alleged coupling always takes place. Thus, when we compare the sea coasts all over the globe, we find, with some exceptions, that twice a day the sea advances and recedes on the shore: this fact we express by the general name the tides. When, however, we go further, and note everywhere the *coincidence* between the tides and the positions of the moon, and generalise that coincidence, we attain to a more complicated result. We are now called upon to believe not merely in the accurate correspondence of a general notion with the particular objects, but in the constancy of the conjunction between two distinct properties, so that the occurrence of one shall always count as evidence of the other. The different aspects of this higher operation have given rise to another series of designations, contrasting with those given above for the simpler operation; these are Induction, Inductive Generalisation, Conjoined Properties, Affirmation, Proposition, Judgment, Law, Order of Nature. These all involve truth or falsehood, inasmuch as they all pretend to give us a positive assurance that wherever we find one thing we shall find some other thing present or absent, and be enabled thereby to anticipate our individual experience of the course of nature. A general notion can often be expressed in a single word; the *noun* is the part of speech that names both particular objects and general notions. A general proposition is a complete thought, and requires a sentence for its enunciation; it involves the *verb* along with the noun. Heat is a notion, and so is Light; but when we unite the two in the affirmation that heat is the cause of light, we indicate something that is true or false, that may be proved or disproved, believed or denied.

This higher form of generalisation is treated of under INDUCTION. On the other and simpler form, a few further explanations are added here. In the operation of forming a general notion, the first step is something of the nature of Classification. We must assemble in our view a number of particular objects, being moved to bring them together by the attractive bond or association of similarity. The objects thus assembled are a class. In Natural History, for example, we bring together in the mind all the quadrupeds that we have ever had any knowledge of, and the array constitutes a class, grounded on the peculiarity of walking on all-fours. Another class is made up of the animals that fly in the air; a third, of those that live in the sea. By such successive groupings of creatures that have a kindred nature in one or more respects, we gradually include the whole of the animal kingdom known to us in a series of classifications, whereby method and order are introduced into the otherwise heterogeneous mass. So in plants and minerals, and all through nature. According as likenesses have been discerned in the constituent parts of the universe of things, the individuals are placed with those related to them, and a great simplification of view and extension of knowledge are the results. For it happens very frequently, that likeness in one point is accompanied with likeness in other points, so that we can couple several peculiarities together, and rise to general truths as well as general notions. When a classification has been arrived at that leads to this consequence, we put a more than ordinary value upon it; we consider that we have seized upon some fundamental and pregnant point of resemblance, something that conveys the most essential nature of the objects classified, and we are accustomed to style the group that so arises a *natural* or a *philosophical* classification. The arranging of animals according to the element they live in, as land, water, air, so very obvious to the first observers, has given place to one founded on other kinds of likeness—namely, the structure of the skeleton and the mode of bringing forth and rearing the young; it being proved that a greater number of important attributes are bound up with those characteristics than with the element that the animals inhabit. See Mill's *Logic*, book iv. chap. 7.

The forming of a class leads to the adoption of a Class Name, in other words, of a *general name*, which is a name applicable to every individual member of the class, in consequence of being understood to express no more than they all have in common. Thus we have the name 'round' to express all round objects, omitting any reference to other peculiarities that may attach to them. So the names 'bird,' 'heath,' 'salt,' are applicable alike to a vast number of individual things. When the general name has been devised, we can by means of it speak of all the particulars in one breath, on condition that we intend only to refer to the points of community.

The process called Abstraction is further implied. When we bring together, or constitute a class, in virtue of a prevailing resemblance, we are said to 'abstract' from the individuals everything else except the points of agreement. In the language of Sir W. Hamilton, we *attend* to the likeness and *abstract* the differences. The notion that we have of the common quality is termed by the same philosopher the Concept; but it has been usual to employ the phrase 'abstraction' or 'abstract idea' for the same purpose, although a perversion of the original application of that word. The common attribute of round bodies, the round figure, or form, is the concept, or the abstract idea of roundness. The precise character of this mental element or process has been much disputed in philosophy, there being three different sects that have grown up in connection with it; the Realists, Nominalists, and Conceptualists. The Realists gave an actual independent existence to the prototypes of our general notions, maintaining that apart from all circular bodies there existed in nature a circular *form*, having no other attribute soever, like a circle of Euclid bereft of the actual line required to mark the figure to the eye. The Nominalists considered that the only general thing was the common name; the Conceptualists allowed a mental existence to the generalised attributes, but no more. (Sir W. Hamilton's *Metaphysics*, vol. ii. p. 296.) The last are, no doubt, near the truth; for although we cannot, with Plato, affirm the existence in nature of 'generals' that have no embodiment in particulars (which would be to contradict the very essence of generalisation, namely, likeness *among unlikenesses*), we must still grant to the mind the power of attending in thought to what is common, neglecting for the time the disagreements. We can think of all the consequences of the circular figure, without specially attending to the other peculiarities of any individual circle. This abstractive process is performed in different ways, according to the nature of the subject. In geometry, for example, we can draw diagrams that are little other than naked forms, although we must make them of a definite size; and in contemplating these, we are enabled to think of form without substance. We cannot use this method in Natural History; we cannot form a conception of a bird by a diagram that gives nothing but what is common to all birds. If we are reasoning upon the properties of the class, we may first call into view some one as an example, say a pigeon; from considering which, we can go so far as to note the common peculiarities of feathers, wings, bill, &c.; and when we have completed the description, we run over in our mind a number of other birds, to see that we have not mentioned points special to the pigeon. In fact, we must have within call the whole of the members of the class, if we would reason generally respecting it. After we have thus checked and corrected our generalised description, we can embody the abstract idea in a form of very wide occurrence in our general reasonings, namely, a verbal statement of the common attributes. By means of this, we may often dispense with the reference to the particulars, except to know the precise meaning of the language, which meaning is still some sort of general conception of the objects. We must have a general notion of feathers, and of the structure of the bill in birds, upon the plan above mentioned of holding in the mind some typical instance subject to correction by a comparison of all the instances coming under the genus. So that, in point of fact, no general reasoning has ever been invented to supersede totally this reference to the particulars; the formal reasonings of mathematics require us still to have in the mind concrete quantity, or one thing as equal to, greater than, or less than, another.

These remarks lead us to the nature of Definition, which is one of the important designations growing out of the operation of generalising. To define, is to limit, settle, and specify the exact compass of the properties common to a class. Usually this is done by means of language; but in reality it is, and must be done, by a reference, direct or remote, to the particulars themselves. This reference frequently has the appearance of being dispensed with. The reason is that many general notions are compounded of others, and we can understand the composite notion from its components, without going further; that is, without producing particulars. Thus, a circle in the abstract might be made intelligible by pointing to a number of concrete circles, such as are drawn in Euclid; we should then have to impress on our minds a sufficient number of these to prevent us from ever associating with the general idea any one size, or any one colour of the outline (which must be drawn in black, red, blue, or some other colour). No one circle is really the general notion; this must be nothing less than a multitude of actual circles, which the mind apprehends by turns, so as to be sure of never affirming any attribute as common that is in fact peculiar to one or a few. But the concept, circle, can be got at in another way. If we determine first what is called a 'point' in space, and a 'line' proceeding from that point, and made to revolve around it, the other extremity of the revolving line will mark a course which is a circle.

Here, if we possess ourselves of the simple notions or concepts, Point, Line, Revolution, we may attain to the notion, Circle, without examining actual circles in the concrete. So we may define an oval, or ellipse, and many other figures. This practice of referring to a simpler order of concepts for the constituents of a given one, is the main function of the Definition, which applies, therefore, to complex notions, and not to such as are ultimate, or simple in the extreme degree. To define in the last resort, we must come to quoting the particulars. We cannot define a line by anything more elementary. To say, with Euclid, that it is length without breadth, is no assistance, as we must still go to our experience for examples of length; and length is not a more simple idea than line, being, in fact, but another word for the same thing. Nevertheless, it has been often supposed that there are general notions independent of all experience, or reference to particulars; the form commonly given to the foundations of the science of mathematics having favoured this view.

The name 'genus' is also connected with the present subject. It is co-relative with another word, 'species,' which, however, is itself to some extent a generalisation; for every species is considered to have individuals under it. Thus, in Zoology, *felis* is a genus of animals, and the lion, tiger, cat, &c., are among its species; but each of those species is the generalisation of an innumerable number of individual lions, tigers, &c., differing considerably from one another, so that to express the species we are still obliged to have recourse to the operations of comparison, abstraction, and definition. Genus and species, therefore, introduce to us the existence of successive generalisations, more and more extensive in their range of application, and possessing, in consequence, a smaller amount of similarity or community of feature (see EXTENSION).

GENERATION. See REPRODUCTION.

GENERATION. A term in use in Mathematics. One geometrical figure is said to be generated by another, when produced or formed by an operation performed upon the other. Thus a cone is generated by making a right-angled triangle revolve about one of its sides adjoining the right angle as an axis. In arithmetic, in the same way, a number is said to be generated when produced by an operation performed on one or more other numbers. Thus, 36 is generated by the involution of 6 to the 2d power, or by the multiplication of 4 and 9.

GENERATION, ETERNAL. See TRINITY, DOCTRINE OF THE.

GENERATION, SPONTANEOUS. From the earliest period to the termination of the middle ages, no one called in question the doctrine that, under certain favourable conditions, of which putrefaction was one of the most important, animals might be produced without parents. Anaximander and Empedocles attributed to this form of generation all the living beings which first peopled the globe. Aristotle, without committing himself to so general a view, maintains that animals are sometimes formed in putrefying soil, sometimes in plants, and sometimes in the fluids of other animals, and lays down the following general principle, 'that every dry substance which becomes moist, and every moist body which is dried, produces living creatures, provided it is fit for nourishing them.' The views of Lucretius on this subject are shewn in the following lines:

> Nonne vides quæcunque morâ, fluidoque liquore
> Corpora tabuerint, in parva animalia verti?

And Pliny maintains that 'quædam gignuntur ex non genitis, et sine ullâ simili origine.' Virgil's directions for the production of bees are known to every reader of the *Georgics*, and an expression in the Book of Judges (xiv. 14) probably points to a similar opinion.

Passing from classical times to the later period of the middle ages, and the two succeeding centuries, we may quote amongst the advocates of this theory Cardan—who, in his treatise *De Subtilitate* (1542), asserts that water engenders fishes, and that many animals spring from fermentation—Aldrovandus, Licetus, Gassendi, Scaliger, Van Helmont, who gives special instructions for the artificial production of mice, and Kircher, who in his *Mundus Subterraneus* (in the chapter 'De Panspermia Rerum') describes, and actually figures, certain animals which were produced under his own eyes by the transforming influence of water on fragments of the stems of different plants!

Redi, the celebrated Italian naturalist, whose *Experiments on the Generation of Insects* were published in 1668, seems to have been the first opponent that the doctrine of spontaneous generation encountered. In this work, he proves that the worms and insects which appear in decaying substances are in reality developed from eggs, deposited in those substances by the parents. Leuwenhoek, Vallisneri, Swammerdam, and other eminent naturalists, soon contributed additional facts and arguments in favour of Redi's view; and as from the time of Redi to the present day, the tide of opinion has generally turned strongly against the doctrine in question, it is unnecessary to carry the historical sketch further.

The entozoa, however, continued to be a great stumbling-block. 'When,' says Professor Owen, 'the entozoologist contemplated the *tænia* fixed to the intestine, with its uncinated and suctorious head buried in the mucous membrane, rooted to the spot, and imbibing nourishment like a plant—when he saw the sluggish *distoma* (or fluke) adhering by its sucker to the serous membrane of a closed internal cavity, he naturally asked himself how they got there; and finding no obvious solution to the difficulty of the transit on the part of such animals, he was driven to the hypothesis of spontaneous generation to solve the difficulty. It is no wonder that Rudolphi (1808) and Bremser (1824), who studied the entozoa rather as naturalists than physiologists, should have been led to apply to them the easy explanation which Aristotle had given for the coming into being of all kinds of Vermes—viz., that they were spontaneously generated. No other explanation, in the then state of the knowledge of the development of the entozoa, appeared to be adequate to account for the fact of their getting into the interior cavities and tissues of higher animals.' The recent investigations of Von Siebold, Küchenmeister, Van Beneden, Philippi, &c., regarding the development and metamorphoses of the entozoa, have, however, tended to remove nearly all the difficulties which this subject presented; and the advocates of spontaneous generation are fairly driven from this, one of the last of their battle-fields.

The only point at present in dispute is, whether microscopic organisms (animals or plants) may be spontaneously generated. It is well known that if we examine under the microscope a drop of water in which almost any animal or vegetable substances have been infused, and which contains the particles of such substances in a state of decay or decomposition, it is found to swarm with minute living organisms. The question at issue is this: Are these organisms developed in the water, if the necessary precautions have been taken to exclude every animalcule or germ capable of development both from the water and from the air that has access to it? A well-known experiment, devised by Professor Schulze of Berlin (a description of which may be found in Owen's *Lectures on the Invertebrate Animals*, 2d ed. p. 44), shews that with due precautions in reference to these points, no animal or vegetable organisms are produced. This experiment was continued uninterruptedly from the 28th of May until the beginning of August, 'and when, at last, the professor separated the different parts of the apparatus, he could not find in the whole liquid the slightest trace of infusoria or confervæ, or of mould; but all three presented themselves in great abundance a few days after he had left the flask standing open.' A vessel with a similar infusion, which he placed near the apparatus, contained vibriones and monads on the second day of the experiment, to which were soon added larger polygastric infusoria.

A few years ago, M. Pouchet announced that he had repeated Schulze's experiment with every precaution, but that animalcules and plants were invariably developed in the infusion on which he operated. To prove that the atmospheric air contained no germs, he substituted *artificial* air—that is to say, a mixture of 21 parts of oxygen gas with 79 of nitrogen. The air was introduced into a flask containing an infusion of hay, prepared with distilled water and hay that had been exposed for twenty minutes to a temperature of 212°. He thus apparently guarded against the presence of any germs or animalcules in the infusion or in the air. The whole was then hermetically sealed, so that no other air could gain access; yet after all these precautions, minute animal and vegetable organisms appeared in the infusion. He repeated the experiment with pure oxygen gas instead of air, and obtained similar results. These experiments are described by Pouchet in the *Annales des Sciences Naturelles* (1858, 4th series, vol. ix. p. 372), and the same volume contains important articles by Milne Edwards, and by De Quatrefages, in opposition to Pouchet's views.

A very large majority of our physiologists of the present day reject the doctrine; most of the apparently exceptional cases, as, for example, the mysterious presence of the entozoa, have been found to admit of ready explanation; and if we do not positively deny the possibility that animalcules may be generated spontaneously, we may at all events assert that such a mode of generation is not probable, and has certainly not been proved to exist. Those who wish to know more fully the arguments that may be adduced in favour of, and in opposition to, the doctrine, are referred, on the one hand, to Pouchet's *Hétérogénie, ou Traité de la Génération Spontanée, basé sur de Nouvelles Expériences* (1859); and, on the other, to Pasteur's *Mémoire sur les Corpuscules Organisés qui existent dans l'Atmosphere; Examen de la Doctrine des Générations Spontanées*, in the *Annales de Chimie et de Physique* (3d ser. 1862, vol. lxiv. pp. 1—110), which seems to place the question beyond the reach of any further discussion.

GENERATIONS, Alternation of, a phrase devised by Steenstrup, a Danish naturalist, about twenty years ago, to signify 'the remarkable and till now inexplicable natural phenomenon of an animal producing an offspring, which at no time resembles its parent, but which, on the other hand, itself brings forth a progeny which returns in its form and nature to the parent animal, so that the maternal animal does not meet with its resemblance in its own brood, but in its descendants in the second, third, or fourth degree or generation; this always taking place in the different animals which exhibit the phenomenon in a *determinate* generation, or with the intervention of a *determinate* number of generations.'

The phenomenon has been observed in many of the *hydrozoa*, in various *entozoa*, in *annelids*, in *molluscoids* (*salpæ*), and in insects (*aphides*); and its nature will be best understood by our giving one or two illustrations.

We commence with the development of the *medusæ* or *jelly fishes*, which belong to the class *hydrozoa*. The medusa discharges living young, which, after having burst the covering of the egg, swim about freely for some time in the body of the mother. When first discharged or born, they have no resemblance whatever to the perfect medusæ, but are little cylindrical bodies (fig. 1, *a*), covered with cilia, moving with considerable rapidity, and resembling infusoria. After moving freely in the water for some days, each little animal fixes itself to some object by one extremity (*e*), while at the opposite extremity a depression is gradually formed, the four corners (*b*, *f*) becoming elongated, and gradually transformed into tentacles (*c*). These tentacles increase in number till the whole of the upper margin is covered with them (*g*). Transverse wrinkles are then seen on the body at regular intervals, appearing first above, and then extending downwards. As these wrinkles grow deeper, the edge of each segment presents a toothed appearance, so that the organism resembles an artichoke or pine-cone, surmounted by a tuft of tentacles (*h*). The segments gradually become more separated, until they are united by only a very slender axis, when they resemble a pile of shallow cups placed within each other (*i*). At length the upper segment disengages itself, and then the others in succession. Each segment (*d*) continues to develop itself until it becomes a complete medusa (*k*); while the basis or stalk remains, and produces a new colony. Here, then, we have the egg of the medusa gradually developed into the polypoid organism (*h*), to which the term *strobila* (from *strobilos*, a pine-cone) has been given. This polype, by gemmation and fission, yields medusæ with reproductive organs.

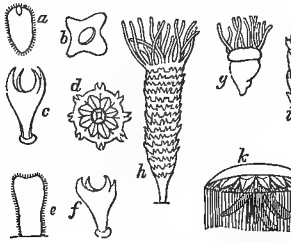


Fig. 1.

The phenomenon of alternation of generations in the Cestoid Worms (q. v.), and in certain Trematoid Worms (see Fluke), has already been noticed, and will be further discussed in the article Tape-worms. The fission of certain annelids (Syllis and Myrianida), (see Reproduction), presents an example, although at first sight a less obvious one, of alternation of generations, the non-sexual parent worm yielding by fissure progeny containing spermatozoa and ova, from which again a non-sexual generation is produced.

The *Salpæ* (*mollusca* or *molluscoids* belonging to the family *Tunicata*) are usually regarded as affording a good illustration of the phenomenon under consideration. It was in these animals that it was originally noticed by Chamisso, who accompanied Kotzebue in his voyage round the world (1815—1818). The Salpæ (from twenty to forty in number) are united together by special organs of attachment, so as to form long chains, which float in the sea, the mouth (*m*), however, being free in each. The individuals thus joined in chains (fig. 2, A) produce eggs; one egg being generally developed in the body of each animal. This egg, when hatched, produces a little mollusc (fig. 2, B), which remains solitary, differs in many respects from the parent, does not produce an egg, but propagates by a kind of internal gemmation, which gives rise to chains already seen within the body of the parent, which finally bursts and liberates them. These chains, again, bring forth solitary individuals.

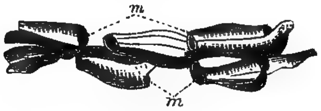


Fig. 2, A.

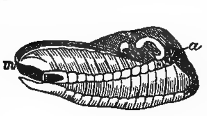


Fig. 2, B.

The only instance in which this phenomenon occurs in animals so highly organised as insects is in the *Aphides*, or Plant-lice. In many species of the genus *aphis*, which in the perfect state possess wings, a large proportion of the individuals never acquire these organs, but remain in the condition of larvæ. These without any sexual union (none of them, indeed, being males) bring forth during the summer living young ones resembling themselves; and these young ones repeat the process, till ten or eleven successive broods are thus produced; the last progeny, towards the end of the summer, being winged males and females, which produce fruitful eggs that retain their vitality during the winter, and give birth to a new generation in the spring, long after their parents have perished. Other peculiarities of insect-generation will be noticed in the article PARTHENOGENESIS.

Several high physiological authorities, amongst whom we may especially mention Huxley ('On the Anatomy of Salpæ,' in *Phil. Trans.* for 1851, and 'On Animal Individuality,' in *Ann. of Nat. Hist.*, 2d ser., vol. ix. p. 505), and Carpenter (*Principles of Comparative Physiology*, 1854), object to the term 'alternation of generations.' The detached portions of the stock originating in a single generative act are termed *Zöoids* by these writers, whilst by the term *animal* or *entire animal* (the equivalent of *Zöon*) they understand in the lower tribes, as in the higher, *the collective product of a single generative act.* Here they include under the title of *one generation* all that intervenes between one generative act and the next. 'If,' says Dr Carpenter, 'the phenomena be viewed under this aspect, it will be obvious that the so-called "alternation of generations" has no real existence; since in every case the whole series of forms which is evolved by continuous development from one generative act repeats itself precisely in the products of the next generative act. The alternation, which is very frequently presented in the forms of the lower animals, is between the products of the *generative act* and the products of *gemmation*, and the most important difference between them usually consists in this—that the former do not contain the generative apparatus which is evolved in the latter alone. The generating zöoid may be merely a segment cast off from the body at large, as in the case of the *Tape-worms* (q. v.), or it may contain a combination of generative and locomotive organs, as in the self-dividing *Annelidæ.* It may possess, however, not merely locomotive organs, but a complete nutritive apparatus of its own, which is the case in all those instances in which the zöoid is cast off in an early stage of its development, and has to attain an increased size, and frequently also to evolve the generative organs, subsequently to its detachment; of this we have examples in the *Medusæ* budded off from Hydroid Polypes, and in the aggregate *Salpæ.*' —*Principles of Comparative Physiology*, p. 529.

GENESEE′, a remarkable river of North America, rises about 10 miles south of the boundary between the states of Pennsylvania and New York, flows north through the western portion of the latter state, and after a course of 145 miles falls into Lake Ontario, 7 miles north of the city of Rochester. The G. is not only notable for the varied and romantic character of its scenery, but is also famous for its extraordinary falls. Of these falls, which are five in number, three, occurring within a distance of two miles, in the vicinity of the town of Portage, about 90 miles from the mouth of the river, are respectively 60, 90, and 110 feet high. The other two, the one occurring immediately above Rochester, and the other about 3 miles below that city, are both of about 100 feet.

GE′NESIS, or more fully **GENESIS KOSMOU** (Origin, Generation of the World), is the name first given by the Septuagint to the opening book of the Pentateuch. In the Hebrew canon it is called *Bereshith* (In the Beginning), from the initial word; in the Talmud, it is sometimes referred to as 'The Book of Creation,' or 'The Book of Abraham, Isaac, and Jacob.' Its Masoretic division into fifty chapters, followed in the English Bible, or into 12 large and 43 small encyclical sections (*Sedarim, Parshioth*), has been grounded rather on convenience than on any corresponding division of the subject-matter. The book seems of itself to fall most naturally into two totally distinct parts: the first of which would extend from the beginning to the call of Abraham (c. i.—xii.), and embrace the account of the creation, paradise, fall, the generations between Adam and Noah, together with their religion, arts, settlements, and genealogy, the deluge, the repeopling of the earth, the tower of Babel, the dispersion of the human race, and the generations between Noah and Abraham: thus forming an introduction to the second part (c. xii.—l.), or the history of the patriarchs (Abraham, Lot, Ishmael, Isaac, Jacob, Esau, and Joseph); the whole concluding with the settlement of Jacob's family in Egypt. Another division seems indicated by the inscription *Toledoth* (Origin, Generation), which occurs ten times in the course of the book, introducing at each repetition a new cycle of the narrative, and which would thus split the whole (from c. ii. 4) into ten distinct sections of disproportionate length.

The period of time over which the Book of Genesis extends has been variously computed; the number of years commonly assigned to it is about 2300; the variations in calculation seldom exceeding units or tens of years; Bishop Hales alone, following the Septuagint, reckons 3619 years.

Being a portion, and the introductory portion of the Pentateuch—at the same time that it forms a complete whole in itself—it cannot but be considered as laying down the basis for that theocracy of which the development is recorded in the succeeding books. While the design and plan of the Pentateuch is thus also that of Genesis, the latter, however discordant its constituent parts may seem, does not lack the necessary unity. Beginning with the cosmogony, or rather geogony, i. e., the generation of the earth with its animate and inanimate products, and all created things which bear upon and influence it visibly, the record gradually narrows into the history of man, and with the distinct aim of tracing the fate of the one chosen family and people, it singles out Noah, Abraham, Isaac, Jacob. The narrative dwells with careful minuteness upon their fortunes, laying especial stress on their intimate communion with God, and, with the three last, on the reiterated promises of the land which they should inherit: 'they and their seed after them.' The remainder of the human race is summarily treated of; the various founders of tribes and peoples that represent it being generally but briefly named. It is only in the case of brothers, or very near relations of the elect, that certain incidents of their lives are more fully recorded; plainly with the intention of proving the inferiority of their claims to divine consideration, or even of representing them as meet objects of the displeasure of the Almighty:—Ham, Ishmael, Esau. From c. xxxvii. to the end of the book, we have exclusively the one chosen family of Jacob and his children before our eyes; and the strictly national character, which the narrative now assumes, excludes everything but the fortunes of this particular house. Here, also, an unbroken, flowing style takes the place of the former apparently sketchy and sometimes abrupt manner. With the occupation by Jacob's rapidly developing tribe of the land of Goshen, this first great patriarchal period is brought to a fitting close, and the second ushered in, when the tribe reappears after a lapse of time as a people. The Maker of all things, having by the creation of one man and one woman placed all mankind on an equal footing, by his sovereign will subsequently elected one righteous from out the mass of human corruption, and through this man's progeny—whose history is told at length —mankind is in the end to be reclaimed:—this seems the pith of the book, considered as a religious history of man.

A certain apparent difference of style and language; the occurrence of what seemed gaps on the one, and repetitions and contradictions on the other hand; the special headings (*Toledoth*) above mentioned; and, lastly, the different use of the term for the divine name, led very early to the question of the integrity of Genesis. Celsus, Isaac, C. Jasos, Aben Esra, Karlsstadt, Spinoza, all assumed smaller or larger interpolations; that is, pieces evidently not written by the author of the book himself, but added afterwards. It was not before 1753 that the 'Hypothesis of Documents,' based on the alternate use of the word *Jehova* (Everlasting) and *Elohim* (Almighty) was first broached. While the Talmud, Tertullian, St Augustine, Chrysostom, Jehudah Hallevi, &c., had all endeavoured to explain how the individual word was always necessary in the special passage where it occurred, Astruc, a Belgian physician, published in that year his *Conjectures sur les Mémoires originaux dont il paroit que Moyse s'est servi pour composer le livre de Genèse*, in which he endeavoured to shew that this writer, or rather editor of the book, had made use of two large and ten small—respectively 'Elohistic' and 'Jehovistic' —documents for his composition. This theory was at first received with silent contempt in the writer's own country. The only man who took any notice of it was Charban, who at the same time excused himself for refuting this 'absurd but dangerous' theory. It soon, however, found its way to Germany, where it was warmly advocated and developed by Eichhorn (*Repert.* and *Introd.*), Ilgen, and Gramberg. A further step was taken by Vater and Hartmann, to whom belongs the 'Hypothesis of Fragments,' or of the whole Pentateuch being a Mosaic of fragments by various authors. Both these notions have now been pretty generally rejected, chiefly on account of their incompatibility with the apparent unity of the whole work and its single parts. The theory adopted by the majority of biblical critics of our day, among whom may be mentioned Wette, Lengerke, Knobel, Stähelin, Bleek, Tuch, Delitzsch, and Bunsen, is the 'Complementary,' according to which the author of the Pentateuch—the Jehovist—had worked upon an old Elohistic fundamental record which embraced the time from the creation to the death of Joshua, altering, enlarging, and completely rewriting it. Ewald and Hupfeld, however, assume four writers; the former two Elohists and two Jehovists, the latter three Elohists and one Jehovist; while the apologetic school of Hengstenberg, Hävernick, Keil, attempts to uphold the primitive theory of one single author.

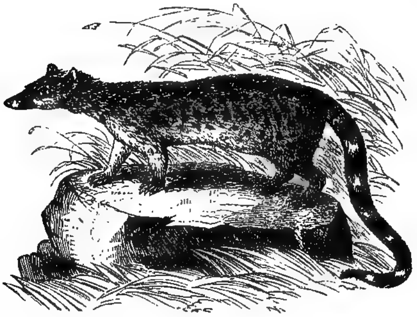
Considered from the remotest time as a book written under the influence of divine inspiration —a term very differently understood—and thus raised above all doubt as to its truthfulness, various efforts were made, from the days of the earliest interpreters to our own, to explain, by allegory and symbol, such of its statements as in their plain sense seemed incomprehensible to human understanding. Philo and the Alexandrines generally, Papias, Irenaeus, Justin Martyr, and others, in all seriousness spiritualised into divine parable that which was given as history; so much so, that St Augustine—exemplifying the spirit of the times—shortly after his conversion, explains paradise to represent nothing more than the happiness of mankind, the four rivers the four virtues, the serpent the devil, the coats of skin immortality, &c. In more recent times, however, after Luther had restored the belief in the literal meaning of the text, some have gone so far as to refer all that is not within the grasp of human reason to the region of myth, and to point to the obvious similarity between the biblical narrative of the paradise, its four rivers, the serpent, the apple, the fall, &c.; and certain legends, common to most eastern nations in the remotest times, as a proof that they were all derived from one and the same mythical source. Since the revival of science in the 16th c., another and much graver difficulty, however, has arisen— viz., how certain distinct and explicit statements of the Scripture, allowing of but *one* translation, were to be reconciled with certain undeniable physical facts. It is more especially the Mosaic cosmogony, as contained in the opening chapters of Genesis, which has given rise to violent controversies. The age of the world, which, according to the Bible, would be 6000, or at most, between 7000 and 8000 years; its creation and the formation of the whole system of the universe in six days; have been declared by astronomers and geologists, who reckon the period of the existence of the earth by millions, of the universe by millions upon millions, to be subjects on which information must be sought elsewhere than in the Bible. Most of the apologists have to a certain degree granted this, and they only differ among themselves as to the extent to which the Bible, a book intended for religious instruction exclusively, has reserved such knowledge as has been or may be acquired by scientific investigation. The words of the biblical record themselves, so far from being in contradiction to the results of human knowledge, are said to convey, if not directly, yet by implication all that science more plainly teaches. The two principal methods of reconciliation advanced in this country are those of Dr Buckland and Hugh Miller (and their followers) respectively, the first of whom adopts and amplifies the Chalmerian interpolation of the geological ages before the first day (an opinion strangely enough to be found already in the Midrash (q. v.): 'Before our present world, the Almighty had created worlds upon worlds, and destroyed them again'), the latter the Cuvierian expansion of the six days into geological ages. On the other hand, it is asserted both by those who hold that the Bible is entirely the work of man, and by those who take it as a mixture of the divine and the human element, that the biblical notion of the cosmogony, as well as of all the other physical phenomena, are simply in accordance with the state of science in the days when the book was compiled.

The apologists adduce, as a further proof of the authenticity of the Bible, the surpassing sublimity and moral superiority of its cosmogony as compared with all others. The dualism of God and matter, which, according to the different pagan systems, are either eternally co-existent or fused into each other, is exchanged for the awful and moving idea of a one personal God, who first created, then moulded, and everlastingly sustains the universe, lavishing his highest gifts on man, made in his own image, and standing towards him in the living relation of a son to a father. The occurrence of similar traditions in the religious records of other primeval nations is taken as a corroborating proof of the historical truth of the biblical account. Recent investigations have likewise affirmed the division of mankind into three principal races, corresponding to Shem, Ham, and Japhet, to be substantially correct, as far as language is concerned.

The question whether Moses really was the author or compiler of Genesis has been negatived by some, chiefly on the ground that certain apparently obsolete names mentioned are explained by others which first came into use at a much later time, and that there are allusions made to events which happened centuries after Moses. Graves, Faber, Rosenmüller, and others, consider such passages to be late additions. The further question whether Moses wrote it while at Midian, or during the forty days on Mount Sinai, or during the forty years' sojourn in the desert, will be considered in the article PENTATEUCH, where also some other points in connection with the composition of this book will be glanced at. Of opinions on the other side, we will briefly mention that of Lengerke, who holds the Elohist to have written under Solomon, and the Jehovist under Hezekiah; of Tuch, who places the former in the time of Saul, the latter in that of Solomon; and of Bleek, who assigns to the Elohist the time of Saul or the Judges, and to the Jehovist the beginning of David's reign.

Of the infinite number of ancient and modern writers who have commented on Genesis, we will mention Cyril of Alexandria, Ephraem Syrus, Theodoret, Procopius, Chrysostom, Jerome, Augustine, Jitzchaki (commonly, but wrongly, called Jarchi), Aben-Ezra, Levi b. Gershom, Abrabanel, Mendelssohn, Michaelis, Vater, Bohlen, Rosenmüller, Eichhorn, Augusti, Faber, Graves, Schumann, Tuch, Knobel, Herder, Hamann, Baumgarten, Delitzsch, Hengstenberg, Keil, Kalisch, Kurtz, &c. See also Turner's and Hävernick's *Introductions to Genesis;* Hugh Miller's *Testimony of the Rocks;* Pye Smith's *Relation between Scripture and Science;* Dr Whewell's *Bridgewater Treatise;* Goodwin's *Mosaic Cosmogony,* &c.

GE'NET (*Genetta*), a genus of quadrupeds of the family *Viverridæ*, nearly allied to the Civets (q. v.), but having only a rudimentary odoriferous pouch, and claws perfectly retractile, as in the *Felidæ*. The approximation to that family also appears in the vertical contraction of the pupil of the eye. The species are numerous; smaller and more slender animals than the civets, mostly natives of Africa and the warmer parts of Asia. One, the common G. (*G. vulgaris*), is found in the south of Europe, as well as throughout Africa. It is gray, with small round or oblong black or brown spots; the tail, which is as long as the body, ringed with black and white. It frequents the banks of brooks. Its fur is a considerable article of commerce. It is easily domesticated, and is kept in houses in Constantinople to catch mice.



Genet (*Genetta vulgaris*).

The GENET is sometimes met with in Heraldry. There was an order of knighthood in France, founded by Charles Martel, called the order of the G., but it has long ceased to exist.

GENE'VA (Fr. *Genève*, Ger. *Genf*, Ital. *Ginevra*), the most populous and flourishing town of Switzerland, capital of the canton of the same name, is situated on the southern extremity of the Lake of Geneva, 70 miles north-east from Lyon, in France. At the time of the contests between the Helvetii and the Romans, G. belonged to the country of the Allobrŏgi. It was afterwards included in the Roman *Provincia Maxima Sequanorum*, and was a place of some importance under the Burgundian kings. On the dissolution of the kingdom of Burgundy, G. fell under the dominion of the Ostrogoths; in the year 536, under that of the Franks; and towards the end of the 9th c., under the new kingdom of Burgundy. It had been made a bishop's seat in the 5th c., and from the 12th c. continual feuds arose between the bishops and the Counts of Savoy with regard to the supremacy. The citizens took advantage of these dissensions to obtain fresh liberties and privileges for themselves. In 1518, the Genevese concluded an alliance with Freiburg, and shortly after with Bern, and thus G. became a member of the Swiss confederation.

The doctrines of the Reformation, boldly and enthusiastically preached by William Farel, met with general acceptance in Geneva. In conjunction with Bern, the citizens expelled the adherents of the Dukes of Savoy—the so-called Mamelukes—from the town, and declared the bishopric vacant. In August 1535, the Reformed religion was established by law; and in 1541, Calvin was invited to take up his residence permanently in G., as public teacher of theology. It was he who chiefly impressed the stamp of rigid morality, not unalloyed with pedantry, on the minds of the citizens of G., and awakened a taste for the exact sciences. The town, which had hitherto been merely a place of trade, thus acquired an important influence over the spiritual life of Europe, and became the centre of education for the Protestant youth of Great Britain, France, Germany, and

Spain. In 1602, the last attempt of the Dukes of Savoy to recover the town was frustrated by the energy and resolution of the citizens.

During the 18th c., G. was distracted by a continued feud between the aristocratic and popular parties, until in 1782, Bern, Sardinia, and, in particular, France, interfered in favour of the aristocracy. The French Revolution led to a new crisis; the government was overthrown in July 1794, equality in the eye of the law was established, a national convention appointed, and a reign of terror commenced. In 1798, G., and its territory, was annexed to France under the name of the department 'Du Leman.' After the overthrow of Napoleon, G. recovered its independence, and the Congress of Vienna increased its territory considerably.

The situation of the town on both sides of the lake where it is narrowed to a point and forms the Rhone, is exceedingly pleasant and advantageous for traffic. Formerly, G. was surrounded by walls, and consisted of clusters of narrow and ill-drained streets; but since the accession of the democratic party to power in 1847 (see next article), a most extraordinary change has been effected, and chiefly through the energy and enlightened views of M. James Fazy, a wealthy native proprietor. The ancient ramparts have been removed, streets widened and well paved, new and commodious quays constructed along the shores of the lake and river, and a spirit of improvement introduced which points to a great extension of the city. Among the latest improvements is the construction of a breakwater, within which, as in a harbour, steam-boats are received and lie in safety, and from which they depart several times daily to the principal ports on both sides of the lake. The two divisions of the town are connected by several wooden bridges, and at present (1862) a new stone bridge is in the course of construction. In rushing through the town, the Rhone parts into two branches, forming two islands, on one of which still exists an antique and picturesque cluster of buildings; on the other, laid out as a public pleasure-ground, there is a statue of Jean Jacques Rousseau, who was a native of the town. Stretching along a part of the new quay, on the left side of the Rhone, there is now a public promenade laid out as a *jardin Anglaise.* As forming a central terminus for French and Swiss railways, G. is a favourite resort of travellers, for whose accommodation there are several large and splendid hotels, commanding fine views of the lake and mountain scenery in the environs. The language spoken is French. The principal edifices are the cathedral church of St Pierre, which dates from 1124; the town-hall; the college, founded by Calvin in 1558, and containing a library of 40,000 volumes; the Musée Rath, so called from the name of its founder, General Rath, and containing good pictures; the observatory, the finest in Switzerland; and the museum of natural history, containing De Saussure's geological collection, Haller's herbarium, the fossil plants of Brogniart and Decandolle, &c. The university (originally established in 1368, and reorganised by Calvin and Beza in 1539) has four faculties—theology, law, science, and belles-lettres. Among the many handsome new public buildings may be mentioned the Post-office, a Catholic and an English church, this last accommodating the large number of English residents and casual visitors. The staple manufactures of the town are watches, musical-boxes, and jewellery; and for the sale of these and other fancy articles, there are many attractive shops. Altogether, G. is to be considered as now one of the most prosperous and improving towns on the continent. In 1860, the population of the city and suburbs was 41,756.

GENEVA, a canton of Switzerland, in the south-west of that country, is bounded on the N. by the canton of Vaud and the Lake of Geneva, and on the S., E., and W., by the territories of France. It has an area of 109 square miles, and in 1860 it had 83,395 inhabitants, of whom 42,355 were Catholics. It is watered by the Rhone and the Arne, which unite about two miles from the south-west extremity of the Lake of Geneva. The surface is hilly, and the soil, not naturally fertile, has been rendered so by the industry of the inhabitants. The political affairs of the canton and city have undergone various changes, the last of these being a revolution in 1847, when the old aristocratic party was overthrown, and a democratic and progressive party attained to power. Long inert, and in a backward condition, the administration is now most active in developing the resources of the canton. According to the constitution of 1847, all male citizens of 21 years of age exercise the right of electing representatives to the cantonal council; the age of members of which must be at least 25 years. There is a representative for every 666 inhabitants. The executive is confided to a council of state composed of 7 members, nominated for 10 years, but eligible for re-election. The constitution guarantees civil and religious liberty, all forms of worship being allowed by law; but the majority of the citizens pertain to the Reformed Calvinistic Church. The chief branches of industry are agriculture, and the manufacture of articles of *bijouterie* and watches. About 100,000 watches are made annually, and exported to France, England, Italy, and elsewhere. Musical-boxes, chronometers, mathematical instruments, &c., are also made. The chief town is Geneva (q. v.).

GENEVA, a village of North America, in the state of New York, is delightfully situated at the north-western extremity of Seneca Lake, 200 miles west of Albany, and 50 miles south-east of Rochester. It is handsomely built, and commands a magnificent view of the lake and the surrounding country. Its principal institutions are the Episcopal church, a Gothic structure in stone; the Geneva Medical College, and the Hobart Free College. This institution, called the Geneva College till 1852, was established here in 1824, and in 1858 it had five professors besides the president and 96 students. Pop. (1855) 5057.

GENEVA, LAKE OF, or the Leman Lake (*Lacus Lemanus*), situated between Switzerland, to which the larger portion belongs, and the recently acquired territories of France. It lies 1150 feet above the level of the sea, and extends for rather more than 50 miles from east to west, in the form of a crescent. Its greatest breadth is eight miles, and its depth between Evian and Ouchy is 920 feet. This lake at some periods of the year presents a curious phenomenon, which has never been sufficiently accounted for, the surface, especially near Geneva, rising and falling through a space of from two to five feet in the course of about 25 minutes. The lake, which is never entirely frozen over, abounds in fish, and several steamers ply upon its waters. The shore on the side of the Pays de Vaud is celebrated for the beauty of its scenery; the southern French shore rises solemn and stern, with the mountains of Savoy in the background. From the Lake of Geneva, Mont Blanc is visible, and although 60 miles distant, is often reflected in its waters. The Rhone enters the lake at the upper end, turbid and yellow, and leaves it at the town of Geneva as clear as glass, and of a deep blue tint. The lake receives about 20 streams from its northern shore, none of which, however, are important.

GENEVIÈVE, a saint of the Roman Catholic Church, the subject of many popular and highly poetical legends, and regarded with special veneration in France and particularly in Paris, of which city she is the patroness. From a nearly contemporary life of St G., we learn that she was born in 422, in the village of Nanterre, near Paris, where, as a mere child, she attracted the notice of Germanus of Auxerre, who passed a night at Nanterre on his return from Britain in 429. Germanus is said to have marked her out as specially destined to a life of holiness and purity; and the child, partly from her natural tendency, partly, perhaps, under the influence of the counsel of so holy a bishop, devoted herself to a life of virginity and conventual seclusion. On the death of her parents, she was removed to Paris; and her active charity, and the extraordinary reputation for sanctity which she acquired both there and in other cities of France, which she visited on missions of Christian benevolence, won for her the admiring veneration, not alone of her own people, but even of the heathen or half-converted tribes, which, about this period, after a long series of struggles, had begun to amalgamate with the ancient population of the Roman province of Gaul. During the Frank invasion under Childeric, G., with her sisters in religion, set out on an expedition for the relief of the starving city, and successfully conveyed to Paris an abundant supply of provisions. The city, when taken, was treated with special leniency through her intercession with the king, and many captives obtained their liberty at her prayer. On the new alarm for the safety of Paris, created by the news of the march of Attila and his army of Huns, it was proposed to abandon the city; but G., assembling the matrons and consecrated virgins in one of the churches, exhorted them to avert, by prayer and fasting, the threatened calamity. The unexpected alteration of the direction of Attila's march added still more to her reputation and to her influence; and it is agreed that her personal example, and that of the sisterhood to which she belonged, appealed, with no inconsiderable effect, to the natural sensibilities of the rude races which now found themselves, for the first time, in contact with the humanising influences of the Christian religion. St G. enjoyed, to an extreme age, the reverence and love of the entire people. She died in 512 at the age of 89, and her memory is still affectionately described as the type of all that is purest and most elevating in the conventual life, as well as of all that is most admirable in the works of charity and benevolence, with which, in the active orders, that life is habitually associated. Under her patronage, and with her name, a religious congregation of priests was founded in the 12th c., which, with some vicissitudes, continued until the Revolution. A religious congregation of women, under the name of 'Sisters of St Genevieve,' was established in 1636, chiefly devoted to the care of the sick and the education of young females.

GENGHIS (Jengueiz, Tchinggis, or Zingis) **KHAN**, originally called Temujin, a celebrated Mongol conqueror, born 25th January 1155 A. D. at Deylun-Yeldâk, near the northern bend of the Feramuran (Hoang-Ho), was the son of Yesukai Bahâdûr, a Mongol chief, who ruled over some thirty or forty families or clans, called the tribe of Neyrun, who dwelt between the Amur and the great wall of China, and paid tribute to the khan of East Tartary. On his father's death, he did not hesitate to assume the reins of government, though only 13 years of age. Some of the subject tribes refused to obey him, and chose another chief belonging to the same family. A war of several years' duration was the result, at the termination of which he was compelled to retire to Karakorum, the capital of Toghrul Ungh Khan, monarch of the Keraeit, and place himself under that monarch's protection. Ungh-Khan gave him his daughter in marriage, and appointed him to the command of his army, in which capacity G. gave proof of great military talent, conquering the Mekreit, Tanjût, Jellâeir, and other neighbouring tribes. But Ungh-Khan, becoming jealous of his growing reputation, and urged on by envious courtiers, ordered G. to be assassinated. The latter, having taken counsel with his relative and chief councillor, Karatchâr Nuyan, a youth of his own age, but renowned in Tartar history for his wisdom, resolved to depart for his native country, which, after many hair-breadth escapes, he reached at the head of 5000 cavalry. Raising an army, he marched against his father-in-law; and Toghrul, vanquished in battle in 1203, sought refuge among the Naymans, but was slain by the guards stationed on the frontiers. G. immediately seized upon Toghrul's dominions. In the following year, a number of Tartar tribes, alarmed at his increasing power, formed a powerful league against him. The command was given to Tai-Ungh-Khan, chief of the Naymans; but in a battle fought on the banks of the Amur, G. utterly routed his enemies, slew their leader, and became at once master of almost all Mongolia. Grander views of conquest seem now to have opened before his vision. In the year 1206, he convoked a kouriltai, or general assembly, on the banks of the Onan, a tributary of the Amur, flowing through his native land. This meeting was attended by deputies from all the subjugated hordes of Tartary, and G. contrived to obtain a religious confirmation of his designs. Up to this period, he had borne the name of Temujin; but a renowned magician or priest, surnamed Bout-Tangri ('Son of Heaven'), venerated by all the Mongols, now came forward and pronounced him *Genghis Khan*—i. e., greatest of khans, or khan of khans, declaring that he should rule over the whole earth. The deputies were duly impressed. About this time the Eighurs, an agricultural and civilised people, inhabiting the country at the sources of the Hoang-Ho and Yang-tse-Kiang, voluntarily submitted to his sway. From this people, who professed Buddhism, the Mongols would appear to have acquired a knowledge of writing. They adopted the Eighur characters, but preserved their own language, and G. selected one of the newly-submitted tribe to instruct his children. The next important incident in his career was the conquest of the northern portion of China, called Khatai. The immediate cause of the war between G. and the emperor of China, Tchong-Hêi, was the refusal of the former to recognise the latter as his suzerain, or liege-lord. Most of the Tartar tribes which G. had subdued were really tributaries of the Chinese empire; and Tchong-Hêi, though not interfering to prevent the conquests of the Mongols, now wished G. to acknowledge his superiority by paying tribute. G. immediately prepared for war, scaled the great wall in 1211, and after a series of bloody and protracted campaigns, Pekin fell into the hands of the barbarians in 1215. Meanwhile G. was called back to Tartary to quell certain insubordinate tribes, headed by Gutchluk, son of the chief of the Naymans, who had recovered his ancestral dominions, and also conquered those of the Gûr-Khân of Kara-Khatai. These tribes were nearly exterminated in a great fight which took place near the sources of the Yenissei. Gutchluk, however, had some time before taken refuge in Turkestân, a vast region stretching from Lake Lob, in the middle of Tartary, westward to the Sea of Aral. Here he succeeded in making himself supreme ruler, but only to be swept away by the victorious Mongols, now pressing westward in an irresistible torrent. At length G. reached the Sihoon, the north-eastern boundary of the empire of Khaurezm or Kharism, whose ruler, Ala-ed-din Mohammed, was one of the most powerful sovereigns in Asia. The dynasty to which he belonged had risen into power through the weakness of the Seljuk sultans; and its sway now extended from the borders of Syria to the river Indus, and from the river Sihon to the Persian Gulf. The murder of some Mongol merchants at Otrâr, a town on the Sihon, afforded G. a pretext for invasion. He immediately despatched his eldest son, Jûjy, at the head (according to Eastern chroniclers) of 700,000 horse, who accordingly burst into Khaurezm in 1219; and after having overthrown the Tartar allies of Sultan Mohammed, and fought a long and bloody battle with the sultan himself with no decisive result, captured Samarkand, Bokhara (the valuable library of which he destroyed), and all the other important cities of the country. The Mongols, in three separate divisions, now scoured and ravaged Khaurezm in all directions. In the course of five or six years, they overran the whole of Persia, subdued the inhabitants of the Caucasus, crossed into Russia, and plundered the land between the Wolga and the Dnieper. Nor were they less successful in the east; the whole of Southern Asia, as far as the Sutlej, experiencing the miseries of their devastations. Sickness, disease, and exhaustion at length enfeebled the Mongol hordes, and compelled G. to return to Karakorum, in Tartary, the capital of his empire, in 1224. During his absence, his generals had been prosecuting the Chinese war with the greatest success. G., though well-advanced in years, was still possessed by the old thirst of conquest; and having recruited his forces, he led them across the great desert of Gobi to the kingdom of Tanjout, in the north-west of China, the capital of which, Nin-hia, he besieged. Disheartened by the loss of the greater part of his army, the king of Tanjout promised to capitulate at the end of a month; but in the interval G. died, the 24th August 1227, on the hill Liou-pan, worn out with years and toils. G. is said to have had five hundred wives and concubines, and to have left a great number of children, among three of whom he divided his enormous possessions. The third son, Oughtai, was appointed 'Grand Khan,' and received for his share the country now called Mongolia, with Khatai or Northern China as far north as the mouth of the Amûr. The second son, Tcheghatai, received Turkestân north of the Amû or Jeyhûn, and was committed to the guardianship of Karatchâr Nuyan. Jûjy, for his share, obtained Keptchâk, and all the country west and north of Turkestân, an immense tract extending from the Caspian Sea almost to the Northern Ocean.

In the course of his sanguinary career, G. is said to have destroyed, by wars and massacres, no fewer than five or six millions of human beings. His conquests were generally accompanied with acts of appalling barbarity, yet we seem to trace through the dreadful history of the man some indications of a civilising tendency. Himself a Monotheist, a stern believer in God after the fashion of Mohammed, he nevertheless tolerated all religions; exempted from taxes and military service physicians and priests; made obligatory the practice of hospitality; established severe laws against adultery, fornication, theft, homicide, &c.; organised a system of postal communication throughout his enormous dominions (mainly, no doubt, for military purposes); and so thoroughly organised what we may call the police or civil authority, that it was said one might travel without fear or danger from one end of his empire to the other. He would also appear to have had a respect for men of learning and virtue, and to have retained several of such about his person. The only memorial of G. now known to exist is a granite tablet, with a Mongol inscription (deciphered by Schmidt of Petersburg), discovered among the ruins of Nertschinsk. This tablet had been erected by G. in commemoration of his conquest of the kingdom of Kara-Khatai.

GE'NII. According to the belief of the old Italian races, genii were protecting spirits, who accompanied every created thing from its origin to its final decay, like a second spiritual self. They were appropriated not only to men, but to all things animate and inanimate, and more especially to places. They were regarded as effluences of the Divinity, and were therefore worshipped with divine honours; sacrifices were annually made to them on various occasions, especially on birthdays, and during the period of harvest. Nay, Jupiter himself was called the genius of men, and Juno of women. Not only had every individual his genius, but likewise the whole people. The statue of the national genius was placed in the vicinity of the Roman forum, and is often seen on the coins of Hadrian and Trajan. The genius of an individual was represented by the Romans as a figure in a toga, having the head veiled, and the cornucopia or patera in the hands; while local genii appear under the figure of serpents eating fruit set before them. (Compare Hartung *Die Relig. der Röm.* l. p. 32, &c., and Schömann *De Diis Manibus, Laribus, et Geniis*, Greifswald, 1840.)—The GENII of the East bear no resemblance to the old Italian genii. Their proper Arabic name is *Djinn* or *Jinn;* and there seems to have been no better reason for translating the word by the Latin term *genius*, than the casual similarity of the sounds. The word Djinn is from an Arabic root, signifying to 'veil' or 'conceal,' and properly denotes an 'invisible being.' The djinns, or Eastern genii, are, in fact, regarded by the Arabs and Persians as an intermediate class of beings between angels and men, and inferior in dignity to both. They are described in poetry as the subjects of a certain Jân Ibn Jân, and as inhabiting the world before the present race of human beings; but they having excited the anger of God by their rebellion, he sent his favourite angel, Hhâris, or according to others, Azazel, to punish and govern them. Some time after, Hhâris himself rebelled, whereupon God condemned him to eternal punishment. From this period, on account of his despair or his apostasy, he was called Eblis or Iblis. The djinns can assume, in an instant, any form they please, whether of man, brute, or monster, the last —in accordance with the popular view of their wicked character—being the one most frequently selected. Such as have read the *Arabian Nights* will have a vivid recollection of the hideous and gigantic shapes under which the genii are wont to manifest themselves, accompanied at times with smoke and thunderings, to terror-stricken mortals. They are in no degree whatever *guardian* spirits like the genii of the old Italians; on the contrary, they are inimical to man's happiness, and can only be subdued by the spells of powerful magicians. See FAMILIAR SPIRITS. The better-informed Easterns, however, do not believe, it is said, in the actual existence of such beings. The Mussulman doctors, it is true, affirm the existence of djinns as an invisible race of supernatural beings, who carry out the purposes of Deity, but they reject altogether the grotesque and repulsive inventions of the Arab and Persian romancers and poets.

GE'NIPAP, a much esteemed fruit of the West Indies and warm parts of South America. The tree which yields it is *Genipa Americana*, of the natural order *Cinchonaceæ*. It is a 2-celled berry, containing many seeds; about as large as an orange, of a whitish-green colour, with a dark purple juice of an agreeable vinous taste.

GENI'STA, a genus of leguminous plants, of which the characters are noticed in the article BROOM. Some of the species are popularly known by the name Broom, some as GREENWEED (q. v.). *G. Anglica*, a much branched, very spiny shrub, not above a foot high, is called PETTY WHIN and NEEDLE FURZE in England, where it is regarded as indicating a very poor soil. The *Genista* of Virgil and other Roman classics is supposed to be *G. Hispanica*, a native of the south of Europe, with branched stiff spines. *Gen* is said to be a Celtic word, signifying a shrub. The name Plantagenet, is from *Planta Genista;* but what plant was intended, and whether the common furze or a species of *Genista*, is not so certain.

GE'NITIVE, the name of one of the 'cases' in grammar (see DECLENSION). In such an expression as (Lat.) *regis filius*, (Eng.) the *king's son*, the form *regis* or *king's* is called the genitive case; and according to the usual explanation, this name was given it, because it indicates the source or origin of the thing joined with it. A much more satisfactory account of the origin of the name, and of the real nature of the genitive case, is that given by Max Müller (*Science of Language*). The terms of grammar were originally applied, not to the parts of speech, but to the elements of thought; they were logical terms before they were grammatical. Long before the now familiar grammatical distinctions of singular and plural, of gender, case, voice, &c. had been thought of, the Greek writers on dialectics, in analysing the different parts of an expressed thought, had distinguished the principal notion—the subject or nominative as it is called—from secondary or dependant notions; the dependency of the latter they expressed by the word *ptosis* (Lat. *casus*), a fall or leaning of one thing upon another; and in such a proposition as, 'the king's son is dead,' they indicated the exact nature of the dependence by calling it the *genikē ptosis*, i. e., the case shewing the genus, kind, or class—the generic case; for while the name 'son' is applicable to every man having parents, 'king's son' is limited to the class of sons having kings for their fathers. One name joined to another in this relation has thus the same effect as an Adjective (q. v.) in limiting its application. It seems probable, indeed, that the termination of what we now call the genitive case, was originally the same as that by which adjectives were formed from nouns. The names thus applied to ideas were by the Greek grammarians of Alexandria transferred to the words expressing them, and were afterwards translated into their Latin equivalents by the Greek grammarians who taught their language to the youth of Rome. But by this time the terms had become strictly technical, and their original signification little thought of; and this may account for the Greek *genike*, the Latin equivalent for which is *generalis*, being rendered by *genitivus*, generating or producing, which would have been expressed in Greek by *gennetikē*.

In English, the genitive is the only case or relation among nouns expressed by a difference of termination, and even it is often expressed by the preposition *of;* as the *river's* brink, or the brink *of the river*. From the frequency with which the form in *'s* indicates that one thing belongs to another, it is often called the *possessive* case. But this name is little applicable in such expressions as a *day's* journey; still less in many cases where the genitive is used in the ancient languages; e. g., *fons lactis*, a fountain of milk. The *generic case*, however, meaning that which limits the other noun to a class or kind, will be found to express the real relation in every conceivable combination.

The termination *'s* has been erroneously supposed to be a contraction for *his*, as if 'the king's son' = 'the king his son.' But this would not account for 'the queen's son,' or for 'men's sons.' Besides *his* itself is the genitive of he, and formed in the same way as king's, for the apostrophe (') is a mere artificial expedient of writing to distinguish the possessive from the plural, and does not belong to the spoken language. The English genitive in *'s* is a genuine relic of the Inflections (q. v.) common at an early stage to all the Aryan languages. *s* was the prevalent ending of the genitive singular in the Anglo-Saxon, and in modern English it has been extended by analogy to all nouns and even to the plural. When the plural ends in *s*, the additional *s* of the genitive is omitted, for the sake of the sound, as kings' sons.

GE'NIUS. This word, which conveys the most lofty eulogium that can be applied to intellectual excellence, meant originally the tutelary god or demon that was anciently supposed to preside over the birth and destinies of every individual human being. The peculiarities attending the character and career of each person came thus to be attributed to the higher or lower nature of their attendant genii. Thus arose one of the meanings now attached to the word—namely, the special bent, aptitude, or faculty, which any one possesses; as a genius for poetry, for music, for mathematics, for statesmanship, and so forth. But this is not the chief or most prominent idea implied in the usual application of the term. If we consult usage, we shall find that genius is more frequently spoken of in connection with the poet, painter, architect, &c., than with the man of science or of practice; as if there was something in the regions of fine art that came more directly home to the susceptibilities of men, and evoked their expressions of admiration and praise. And such is really the case. The artist's function is to touch immediately the chords of human pleasure; the men of practical life, the physician, lawyer, or engineer, have more to do with the deliverance from pains or from obstacles to pleasure, and however necessary their work may be, it is apt to be associated with the dark and gloomy side of our human life.

Undoubtedly, the most important meaning of the term, as pointing to a fundamental peculiarity in which human minds differ, is that connecting it with originality, invention, or creative power, in any department of intellectual activity, artistic, scientific, or practical. Not poetic creativeness alone, but every effort of the inventive faculties of man, by which new and superior combinations and devices are introduced into the world with a view to diminish the pains and add to the pleasures of mankind, may be properly designated 'genius.' Sufficient authority exists for this more extended use of the word, and we may justify it also by the consideration, that there is a common fact in all these different modes of intellectual superiority, while it is further possible that there may be a common foundation for them all in the constitution of the mind. We mark off the department of original power from other departments or modes of the intellect, still of positive value and of real importance—namely, the powers of acquiring and reproducing what has been already produced. Amassed learning, extensive acquisitions in science, educated skill in the common arts or in fine art, may exist in a high degree, and may even confer distinction on the individual and serve useful purposes in life, without the accompaniment of originality. The praise implied in the name 'talent' would be conceded to the best examples of acquired power short of the aptitude for invention. This furnishes the most respectable contrast to genius, being itself something admirable and meritorious. A less esteemed contrast is furnished by the crowd of *imitators* that follow in the wake of any great and original mind, who aim at producing similar effects without the inward spontaneity of the master, and with only the resource of copying his external form and peculiarities. There is a kind of ability amounting to talent in this power of imitation, and literature always contains both good and indifferent examples of it. We are accustomed to speak of poetasters, playwrights, and copyists, among the writers of every literary period. The imitators of Homer in his own time have not survived; but he, as well as every other great genius, may be tracked in subsequent compositions. Spenser's school of poetry makes the largest section of the published poems of the century succeeding him. Pope impressed his style upon last century; and Johnson's balanced prose continued to be reproduced long after his death.

The meaning of genius being thus understood as referring to original creativeness, or inventive power, it has been considered a problem of interest to trace it to its foundations in the mind, with a view to determine whether it be a distinct faculty, or only a superior degree of other recognised powers. Johnson's definition is well known; 'large general powers turned in a particular direction.' This negatives the idea of a specific endowment, and would seem to imply that the man of genius could be anything that he pleased; that Aristotle might have been Pindar, and Homer have discovered the forty-seventh of Euclid; an assumption in the last degree improbable, if not verging on absurdity. There is a class of minds noted for versatility, but they are only a select class. Cæsar was a general, an orator, and a writer, besides being a politician of mark, whether successful or unsuccessful. But, according to the most enlightened theories of the present day, it is usual to consider human beings as born with distinctive endowments; and although there is a common mental organisation at the basis, yet this is supposed to have a plurality of distinct functions, any one of which may rise in degree without the rest. Thus, intellect may be powerful on the whole, without involving a proportionate intensity of the feelings or the volition; the sensibility of the ear may be acute, and that of the eye only average. Now it would be fair to suppose that genius in one line—as, for example, painting—would result from the unusual augmentation of the susceptibilities and powers specially exercised in the art; the sense of colour and of form, skill of hand, and a good recollection of those objects of nature and human life, that are the fitting material of a painter's compositions. So a poet should have a more than common ear for verse, plenty of language, taste for the appropriate images of poetry, and so on. In this way we might, by a kind of analysis, determine which of the faculties common to all men should be exalted to a superior pitch, in order to furnish a genius in each separate walk. This method has been pursued by the phrenologists and by other speculators, and is probably now the received mode of handling the subject. Examples may be seen in Bain on the *Study of Character*.

GENLIS, Stéphanie Félicité, Comtesse de, was born at Champçéri, near Autun, in Burgundy, 25th January 1746, of an ancient but reduced family. Her maiden name was Ducrest. At the age of 15 she was married to the Comte de Genlis; and in 1770, through the influence of her aunt, Madame de Montesson (who had been privately married to the Duc d'Orleans), was made a lady-in-waiting in the household of the Duchesse de Chartres. In 1782, the Duc de Chartres, afterwards known as Egalité, appointed her 'governor' of his children. This appointment gave rise to certain scandalous reports, the truth of which subsequent circumstances appear to have confirmed. Madame de G. wrote a variety of works for her pupils, among others, *Théâtre à l'usage des jeunes personnes, ou Théâtre d'Education* (Paris, 1779—1780); *Adèle et Théodore, ou Lettres sur l'Education* (1782); and *Les Veillées du Château, ou Cours de Morale, à l'usage des Enfants.* On the breaking out of the Revolution, Madame de G. took the liberal side, but was ultimately compelled to seek refuge in Belgium. Afterwards she went to Switzerland, and in the same year proceeded to Altona, in Germany, where she wrote a romance, entitled *Les Chevaliers du Cygne, ou la Cour de Charlemagne;* and also *Précis de la Conduite de Madame de Genlis pendant la Révolution,* as a sort of reply to the accusations of her numerous enemies. When Bonaparte became consul, she returned to Paris, and received from him a pension. From this time she resided constantly in Paris, publishing in rapid succession one book after another till her death 31st December 1830. Madame de G.'s writings amount to about 90 volumes. They are chiefly descriptions of incidents in fashionable society, with which she was thoroughly acquainted, and which she painted in lively colours. As she advanced in life, her writings became more and more polemical and ill-natured. Her *Observations Critiques pour servir à l'Histoire littéraire du 19^{me} siècle* (2 vols. Paris, 1818); and her *Dictionnaire Critique et raisonné des Etiquettes de la Cour, des usages du Monde,* &c.; and her *Dîners du Baron d'Holbach,* subjected her to severe criticism. The last of these contains a great deal of curious but malicious information concerning the freethinkers of the 18th century. Nevertheless, her writings have been very popular, and have passed through several editions. Her voluminous *Mémoires* were written after she had reached her 80th year.

GENNE'SARET, Sea of, called also in the New Testament, *The Sea of Galilee*, and *The Sea of Tiberias* (from the city of Tiberias), and in the Old Testament *The Sea of Chinnereth* or *Cinneroth*, from an ancient town of that name situated on or near its shores. The word G. itself is supposed by some to be merely a corruption of Chinnereth; but others derive it from *Gannah*, a 'garden,' and *Sharon*, the name of a plain, between Mount Tabor and the lake. The Sea, or rather, Lake of G. is about 13 miles long and 6 broad. It lies in the bottom of a great basin, and is undoubtedly of volcanic origin. Although the Jordan runs into it red and turbid from the north, and many warm and brackish springs also find their way thither, its waters are cool, clear, and sweet. Its shores are also enlivened with sparkling pebbles. Now, as formerly, it abounds in fish; but the fisheries are almost entirely neglected. The surrounding scenery is not very beautiful, but its associations are among the most sacred in Palestine. 'Where'er we tread, 'tis haunted, holy ground.' 'Like Jerusalem, the Sea of Gennesaret is enshrined in the heart from childhood. The home of Christ—"His own city"—Capernaum, lay on its shores; many of His miracles were performed around and upon it; He taught the multitudes that followed Him, on the heights over it, along its pebbly beach, and from a boat on its surface; most of the apostles were fishermen, who here gained their daily bread; and one of Christ's last earthly interviews with them, after the crucifixion, was on that occasion when, driven probably by necessity, they had temporarily resumed their old occupation, and had toiled a long night without success' (Porter, *Handbook for Syria and Palestine*, Part ii. page 418). In the time of Christ, the region round about was the most densely populated in Galilee. Nine cities and towns stood on the shores of the lake, while the neighbouring plains and eminences were dotted with numerous large villages. Of the nine cities, seven are now uninhabited ruins; half-a-dozen mud-hovels are sufficient to house all the human life at Magdala, and only Tiberias continues to exhibit some feeble traces of its former prosperity.

GE'NOA (Ital. *Genova;* Fr. *Gênes;* anciently, *Genua*), a city of Italy, situated on the Mediterranean Gulf of the same name, at the foot of the Apennines, 79 miles south-east of Turin, is the chief commercial seaport of the Sardinian provinces. Lat. of light-house, 44° 24′ 18″ N., long. 8° 54′ 24″ E. The pop. of the town of G. is 119,610; that of the province of which it is the capital, 643,380.

From the sea the aspect of G. is a splendid panorama; the slopes of the hills down to the shore are covered with palaces, churches, hotels, and private dwellings, relieved by terraced gardens and groves of orange and pomegranate trees; while the bleak summits of the loftier ranges are capped with forts, batteries, and outworks, which constitute a line of fortification of great strength and extensive circuit.

The fine harbour, of which the diameter is rather less than a mile, is semicircular, and formed by two piers, at the extremity of one of which stands a light-house tower, 300 feet high. Vessels of the largest class can enter inside the harbour, and, notwithstanding the heavy swells occasioned by south-west winds, the harbour is remarkably safe. As yet, however (1862), there is no landing pier for passengers, all of whom, at considerable inconvenience, are carried ashore a distance of nearly half a mile in row-boats. Subject to this drawback, the harbour is visited daily by French and Italian steamers in communication with other ports in the Mediterranean. It is anticipated that the increase of passenger traffic consequent on the opening of the railway to Turin, which has already given rise to sundry improvements, will cause this defect also to be remedied.

Several important establishments are grouped round the port—viz., the arsenal, the convict prison, the custom-house, and the *Porto Franco* or free-port warehouses, where merchandise may be stored previous to its re-exportation free of duty. G. is the great commercial dépôt of a wide extent of country, of which the chief raw exports are olive oil, rice, fruits, cheese, steel, &c.; the manufactured goods exported are velvets, silks, damask, gloves, flowers, paper, soap, jewellery in silver and coral, in all of which industrial branches the excellence of the Genoese workmen is incontestable. The imports are principally cottons, raw cotton, woollens, cochineal, indigo, grain, hides, &c. The annual exports of G. are valued at £3,000,000, while the imports are returned at £2,000,000.

While strikingly grand as viewed from the sea, and so far worthy of being entitled *La Superba*, a closer examination of G. tends materially to lower its character for beauty and magnificence. Hemmed within walls, and built awkwardly on irregular rising grounds, it has never been opened up by any comprehensive plan of improvement, and remains very much a labyrinth of narrow and intricate lanes, accessible only to foot-passengers, or to the pack-mules, by the use of which a large portion of the internal goods traffic is conducted. These thoroughfares, into which the light of day imperfectly penetrates, are lined with tall buildings, some of them of marble and of handsome architecture, but they can with difficulty be seen from the limitedness of the space in front; and however grand, they consequently fail in effect. Many of them—once the residence of merchant-princes—are now transformed into hotels or business establishments; in some cases, the superb lobbies, environed by marble columns, being occupied by petty traders, and shabby in the extreme. Only a few streets are wide enough for carriages, and in these the aspect of affairs is more like that of modern cities. Fallen from their high estate generally, several *palazzos* still belong to persons of distinction who have the means of maintaining them in their original splendour, or they are appropriated as public buildings. The two most famous are the Palazzo Ducale, formerly inhabited by the doges, now appropriated to the meetings of the senate; and the Palazzo Doria, presented, in 1522, to the great Genoese citizen Andrea Doria, whose residence it was during his presidency of the Republic. The palaces Brignole Sale, Serra, Reale, Pallavicini, Spinola Balbi, Negroni, and many others, possess great interest both on account of their historical fame and architectural beauty. Many of them contain galleries of paintings, which are shewn for a fee. Some of the churches are particularly fine: the most noticeable of all being the cathedral of St Lorenzo, a grand old pile in the Italian Gothic style. G. contains many excellent public institutions, which almost all date from the period of the republic. The great hospital, and the asylum for the poor (*Albergo de' Poveri*), are especially worthy of mention. The latter makes provision for 1600 persons, orphans and old people. The former are trained up to useful employments, and such girls as marry out of the hospital receive a small dowry. The deaf and dumb institution, and the hospital for the insane, are the first in Italy in point of extent and regulation. There are numerous excellent foundations called *conservatorie*, devoted to various philanthropic purposes, the chief of which is called the Fieschine, and is an asylum for female orphans. The public library contains 50,000 volumes, and is unrestrictedly open to the public. The Academy of Fine Arts was founded by the Doria family. The theatres of G. are very fine, that of Carlo Felice ranks among the best in Italy.

The Genoese are a shrewd, active, laborious race, and possess all the qualities of a commercial and maritime community. They make skilful and hardy seamen, energetic traders, and thrifty husbandmen, and are still remarkable for the spirit of enterprise and freedom which so strongly characterised the period of the republic. Claiming Columbus as a native of their city, they are now engaged in rearing a public monument in honour of that distinguished navigator. While the main business of the town is evidently maritime, there is also an extensive trade carried on in the manufacture and sale of a peculiar kind of jewellery. This consists of remarkably fine filigree-work in silver and silver gilt, which resembles that of India, and is fully as precious in point of intrinsic value. Few of the many tourists who pass through G. fail to purchase one or more of these pretty and cheap articles of bijouterie.

History.—The early history of G. and of its ancient inhabitants is full of uncertainty, owing to the fabulous traditions by which it is obscured. The Ligurian tribes, who held possession of G. previous to its incorporation with ancient Rome, are of disputed origin. By some historians, they are classed with the Celtic race, while others hold them to be of Greek extraction. G. is first mentioned in history during the Second Punic War, but it then appears to have been a place of considerable importance. In 205 B. C., it became for a short time the head-quarters of Mago, the Carthaginian general, who destroyed it before leaving the country; but in 203 B.C., the Roman prætor, Sp. Lucretius, was commissioned to rebuild it. After Liguria was conquered by the Romans (109 B. C.), G. does not figure much in ancient history; but as a Roman *municipium*, it obviously prospered, for Strabo speaks of it as a 'flourishing town, and the chief emporium of the Ligurians.' Under the Romans, the Genoese retained a considerable degree of internal independence, and were distinguished in the Roman legions by their valour and great physical vigour. On the dismemberment of the Latin empire, G., in common with the chief divisions of Italy, successively fell under the sway of the Lombards, the Franks, and the Germans; but amid all these vicissitudes, preserved, in a singular degree, both privileges and prosperity. Navigation and commerce were the two natural sources opened to the Genoese by the maritime situation of their country, and for these pursuits they have at all times displayed a special aptitude. Their mercantile interests only served to foster the instinctive valour of the race. The rich merchandise of the Genoese galleys offered an alluring prize to the piratical hordes by which the Mediterranean was universally infested; and, consequently, from the rise of their commercial importance, the Genoese were compelled to defend with the sword the precious freight of their merchantmen. Unhappily, a bitter spirit of hostility and intolerance of all maritime competition was a leading feature of early Genoese policy, in regard to the other important Italian states; and to this source may be traced the fierce and prolonged wars sustained by G. against the rival maritime republics of Pisa and Venice. The frequent incursions of the Saracens, by whom G. was sacked and pillaged about 935, led the Genoese to form an alliance with Pisa, with the object of extirpating these barbarous aggressors from the islands of Corsica and Sardinia, their strongholds in the Mediterranean. This being effected (1016—1021), the Genoese obtained, by papal arbitration, the grant of Corsica, while Sardinia was assigned to the Pisans, a distribution which sowed the seeds of future discord between the two states. At the close of the 11th c., G. commanded large land and naval forces, and already ranked as a powerful maritime state, governed by annual magistrates, named consuls. The Genoese vigorously seconded the Crusades, and in return for their effective co-operation, obtained several important maritime possessions and commercial privileges in the Holy Land (1109). The chief events of the three following centuries are: the capture of Minorca (1146), of Almeria (1147), and Tortosa (1148) from the Moors; the wars with Pisa and Venice, and the civil dissensions by which G., in common with all Italy, became distracted by the Guelph and Ghibelline factions. In 1284, at the great naval battle of Meloria, the Pisan republic sustained such destructive losses, that her maritime influence and public spirit never revived. The wars with Venice originated, about 1244, in mutual jealousies respecting the commercial supremacy of the Levant, and continued, with various vicissitudes, till the end of the following century, when the Genoese, at the blockade of Chiozza, were compelled to submit to disadvantageous terms by the peace of Turin (1381).

Co-existent with these suicidal wars, the civil dissensions of G. exhausted and demoralised the state, and occasioned an infinity of changes in the primitive form of government. In 1190, the consuls were superseded by a magistracy termed *podesta*, an office for which natives of G. were declared ineligible. This institution, which was founded in the hope of restraining local Genoese animosities and ambitions, lasted till 1270, when two of the great Guelph leaders of the state resolved to subvert the popular authorities, and, under the title of 'captains of liberty,' assumed irresponsible authority, which, for 21 years, they contrived to retain. During their sway, civil feuds raged inveterately, not alone between the Guelph and Ghibelline factions, but also between the citizen ranks of patricians and plebeians. Various other modifications of the government preceded the election of the first Genoese doge in 1339. This supreme magisterial office, from which all nobles were excluded, continued in force for two centuries, its tenure being for life.

The ambitious contentions of four leading democratical families—viz., the Adorni, the Fregosi, the Guarci, and the Montaldi—succeeded those of the patrician houses of Doria, Spinola, Grimaldi, and Fieschi, and engendered such disastrous civil strife in the state under the early doges, that, in 1396, the citizens, in despair, invoked the protection of the French king, Charles VI., and finally submitted to the rule of the Visconte, the tyrannical and ambitious lords of Milan (1464). After the invasion of Louis XII. in 1499, G. long remained subject to the French; but in 1528, the genius and resolution of a great citizen, Andrea Doria, freed his country from foreign invaders, and restored to G. her republican institutions. The last important exploit of the Genoese was the expulsion, in 1746, of the Austrians, who were driven from G. after an occupation of three months. In 1768, G. ceded to France the Island of Corsica; and in 1796 Bonaparte invaded Italy, and conferred on G. the name of the *Ligurian Republic*, which, in 1802, was abolished, and *Genoa la Superba* became the chief town of a department of France. In 1815, by a decree of the Congress of Vienna, the state of G. became a province of Piedmont. Following the fortunes of that state, it has latterly become a portion of the kingdom of Italy, and with the enterprise of its people there are marked indications of improvement. Canale's *Nuova Storia della Repubblica di Genova;* Dinena's *Rivoluzioni d'Italia;* Sismondi's *Italian Republics.*

GENOA, GULF OF, a large indentation in the northern shore of the Mediterranean, north of Corsica, may be said to have the shape of a bay rather than that of a gulf. The towns of Oneglia on the west, and Spezia on the east, seem to indicate the points at which the entrance of the gulf commences. With this entrance the Gulf of G. would extend 90 miles across, and 30 miles inland.

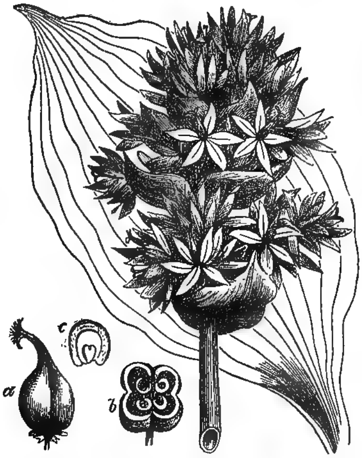
GENOUILLÈRE, a term in Fortification (q. v.) for that part of the parapet of a battery which lies under the embrasure. The name is derived from Fr. *genou*, knee, as representing the ordinary height of the genouillère above the platform on which the gun is worked.

GENRE-PAINTING, a term derived from the French *genre* ('kind,' 'sort'), originally employed to distinguish any special branch of painting, as *genre historique* (historic painting), *genre du paysage* (landscape-painting), &c. In a more definite sense it is used to describe any picture containing human figures not included in the so-called historical class, particularly pictures with figures much below the size of life—cattle, architectural pieces, flower-pieces, and representations of still life. Under the term genre-pictures are comprehended all pictures with figures representing individuals only as types of a species or class, in contradistinction to historical compositions, which bring before us certain individuals, or, as it were, *nomina propria.* The mode of conception and style of execution in genre-painting may resemble the historical style; and, on the other hand, historical personages may be represented merely in situations of everyday life. The term *historic-genre* is employed in both cases. The French likewise distinguish the *genre-historique* from the lower genre, strictly so called; they also occasionally apply the term *peinture du style* to historical painting. Genre pictures are usually of limited dimensions, while in historical pictures the figures are commonly the size of life, or even colossal. In either case, however, there are many exceptions to the general rule, and the proper designation depends rather on the style of subject than on the size. A species of genre-painting with a distinct style was practised even in ancient times, but the birthplace of the present genre picture is the north, and more particularly the Netherlands. The Italians, especially Paul Veronese, had previously shewed a leaning to the genre style in biblico-historical pictures, by making the principal figures and the action subordinate to the accessories and locality—as, for example, in his 'Marriage at Cana;' and Van Eyck's school in the Netherland's had likewise introduced the same element into the delineation of incidents in sacred history. Lucas van Leyden and Albert Dürer then began to represent actual scenes from the everyday life of the people in paintings and engravings. Genre-painting was brought to its highest perfection in the Netherlands by a series of admirable painters, such as Terburg, Brower, Ostade, Rembrandt, the younger Teniers, Metzu, Gerard Dow, and others. Though the characteristic and humorous conception of many of the works of these masters gives them a peculiar value, it was found in other cases that a certain delicacy of imitation and skill in using the brush was capable of imparting a singular charm to the most ordinary scenes and figures. In the British school this style of art is generally understood to be limited to pictures with figures, and many works of the highest excellence have been produced in it, elevated in treatment by the introduction of an important element—viz., the dramatic.

GENS (allied to Lat. *genus*, Eng. *kin;* from the root *gen-*, to beget or produce). This Latin word, to which so many important political and social meanings came to be attached, signifies, properly, a race or lineage. From it our own words Gentleman (q. v.), Gentility, &c., have come to us through the French *gentilhomme*, the primary meaning of which was, one who belonged to a known and recognised stock. By the Romans it was sometimes used to designate a whole community, the members of which were not necessarily connected by any known ties of blood, though some such connection was probably always taken for granted. In this sense we hear of the *gens Latinorum, campanorum*, &c. But it had a far more definite meaning than this in the constitutional law of Rome. According to Scævola, the Pontifex, those alone belonged to the same *gens*, or were 'Gentiles,' who satisfied the four following conditions —viz., 1. Who bore the same name; 2. Who were born of freemen; 3. Who had no slave amongst their ancestors; and 4. Who had suffered no *Capitis Diminutio* (reduction from a superior to an inferior condition), of which there were three degrees, Maxima, Media, Minima. The first (Maxima Capitis Diminutio) consisted in the reduction of a free man to the condition of a slave, and was undergone by those who refused or neglected to be registered at the census, who had been condemned to ignominious punishments, who refused to perform military service, or who had been taken prisoners by the enemy, though those of the last class, on recovering their liberty, could be reinstated in their rights of citizenship. The second degree (Media Capitis Diminutio) consisted in the reduction of a citizen to the condition of an alien (*Latinus* or *peregrinus*), and involved, in the case of a *Latinus*, the loss of the right of legal marriage (*connubium*), but not of acquiring property (*commercium*); and in the case of the *peregrinus*, the loss of both. The third degree (Minima Capitis Diminutio) consisted in the change of condition of a *paterfamilias* into that of a *filius familias*, either by adoption (*adrogatio*) or by legitimation. In the identity of name, some sort of approach to a common origin seems to be here implied. The gens thus consisted of many families, but all these families were supposed to be more or less nearly allied by blood—to be, as we should say, kindred. A Roman gens was thus something very nearly identical with a Celtic clan, the identity or similarity of name being always supposed to have arisen from relationship, and not from similarity of occupation, as in the case of the Smiths, Taylors, Lorimers, &c., of modern Europe. There was this peculiarity, however, about the gens which did not belong to the clan—viz., that it was possible for an individual born in it to cease to belong to it by *capitis diminutio*, or by adoption, or adrogation as it was called when the person adopted was *Sui Juris* (q. v.). If the adoption was by a family of the same gens, the gentile name, of course, remained unchanged. In the case of a person dying intestate, his gentiles, failing nearer relatives, were his heirs, and they undertook the duties of guardianship in the like circumstances. The gens was further bound together by certain sacred rites, which were imposed on the whole of its members, and for the celebration of which it probably possessed, in common property, a *sacellum* or sacred spot enclosed, and containing an altar and the statue of the god to whom it was dedicated. According to the traditional accounts of the old Roman constitution, the gentes were a subdivision of the curiæ, as the curiæ were subdivisions of the tribe. In this view of the matter, the original idea of the gens becomes simply that of the smallest political division, without any relation to kindred or other ties.—An excellent article on the gens by Mr George Long, in which references to the principal German authorities on the subject are given, will be found in Smith's *Dictionary of Roman Antiquities.*

GE'NSERIC, king of the Vandals, was an illegitimate son of Godigiselus, who led the Vandals into Spain. After the death of his brother Gonderic, G. became sole ruler. In the year 429, he invaded Africa on the invitation of Count Boniface, the viceroy of Valentinian III., Emperor of the West, who had been goaded on to rebellion through the machinations of his rival Aetius, the conqueror of Attila. G.'s army at first amounted to 50,000 warriors, full of barbarian valour, and hungry for conquest and plunder. As they swept along through Mauritania, the Kabyle mountaineers, and the Donatist heretics, maddened by persecution and fanaticism, swelled the terrible horde, and more than equalled their savage associates in acts of cruelty and bloodthirstiness. The friends of Boniface, astonished that the hero who alone had maintained the cause of the emperor and his mother Placidia during their exile and distress, should have been guilty of such a crime, attempted, with ultimate success, to bring about an interview between the Count of Africa and an agent of the empress. Then, when too late, were the imaginary provocations he had received explained, and the fraud of Aetius detected, for the army he had hurriedly collected to oppose the Vandals, having been twice defeated by G., he was compelled to retire to Italy, where he was soon afterwards slain by Aetius. All Africa west of Carthage fell into the hands of G., who shortly after seized that city itself, and made it (439 A. D.) the capital of his new dominions. Part of Sicily, Sardinia, and Corsica was likewise taken possession of by him. In the year 451, he encouraged Attila to undertake his great but fatal expedition against Gaul. Tradition states that, at the request of Eudoxia, the widow of Valentinian, who was eager for revenge upon her husband's murderer Maximus, G., in the year 455, marched against Rome, which he took, and abandoned to his soldiers for 14 days. On leaving the city, he carried with him the empress and her two daughters, one of whom became the wife of his son Huneric. The empire twice endeavoured to avenge the indignities it had suffered, but without success. First the Western emperor, Majorian, fitted out a fleet against the Vandals in 457, which was destroyed by G. in the bay of Carthagena; second, the Eastern emperor, Leo, sent an expedition under the command of Heraclius and others in 468, which was also destroyed off the city of Bona. G. died in 477, in the possession of all his conquests, leaving behind him the reputation of being the greatest of the Vandal kings. His appearance was not imposing: according to Jornandes, he was 'of low stature, and lame on account of a fall from his horse,' but 'deep in his designs, taciturn, averse to pleasure, capable of being transported into fury, greedy of conquest, and cunning in sowing the seeds of discord among nations, and exciting them against each other.' Strange to say, a rude, even a savage religiosity burned in the heart of G., and, it may be, grimly sanctified, in his own eyes, his wide-spread devastations. He seems to have regarded himself as a 'scourge of God.' Once when leaving the harbour of Carthage on an expedition, the pilot asked him whither he was going. 'Against all who have incurred the wrath of God.' In creed, G. was a fierce Arian, and inflicted the severest persecutions upon the orthodox or Catholic party.

GE'NTIAN (*Gentiana*), a genus of plants of the natural order *Gentianaceæ*, with 5-cleft—sometimes 4-cleft—calyx, and 1-celled capsule. The species are numerous, natives of temperate parts of Europe, Asia, and America, many of them growing in high mountain pastures and meadows, which they adorn by their beautiful blue or yellow flowers.—The genus is said to derive its name from Gentius, king of Illyria, who was vanquished by the Romans about 160 B. C., and to whom is ascribed the introduction into use of the species still chiefly used in medicine. This species, COMMON G., or YELLOW G. (*G. lutea*), is abundant in the meadows of the Alps and Pyrenees, at an elevation of 3000—6000 feet. It has a stem about three feet high, ovate-oblong leaves, and numerous whorls of yellow flowers. The part employed in medicine is the root, which is cylindrical, ringed, and more or less branched; and which appears in commerce in a dried state, in pieces varying from a few inches to more than a foot in length, and from half an inch to two inches in thickness. It is collected by the peasants of the Alps. Although G. root has been examined by various chemists, its constituents are not very clearly known; it contains, however (1), an oil in small quantity; (2), a pale yellow crystalline matter, termed gentisin or gentisic acid; (3), a bitter principle, gentianite, on which its medicinal properties mainly depend; (4), pectin or pectic acid, which probably causes the gelatinisation that sometimes occurs in infusion of G.; and (5), sugar, in consequence of which an infusion is capable of undergoing vinous fermentation, and of forming the 'bitter snaps' or 'engiangeist' which is much employed by the peasants on the Swiss Alps, to fortify the system against fogs and damps. (As 'bitter snaps' contains a narcotic principle, due probably to the oil of G., strangers unaccustomed to its use should take it with caution.) G. is a highly valued medicine, a simple tonic bitter without astringency, and is much used in diseases of the digestive organs, and sometimes as an anthelmintic.



Common Gentian:
a, capsule; *b*, capsule cut across; *c*, vertical section of seed, magnified.

G. may be administered in the form of infusion, tincture, or extract. The *Compound Mixture of G.* of the London Pharmacopœia, consisting of six parts of compound infusion of G. (Ph. L.), three parts of compound infusion of senna (popularly known as *Black Draught*), and one part of compound tincture of cardamoms, forms, in doses of from one to two ounces, a safe and moderately agreeable tonic and purgative medicine in cases of dyspepsia with constipation. An imitation of the *Compound Tincture of G.*, known as Stoughton's Elixir, is very much used in the West Indies before meals as a pleasant bitter, to give tone to the languid stomach. The *Extract of G.* is very commonly used as the vehicle for the exhibition of metallic substances (such as salts of iron, zinc, &c.) in the form of pill. *Powdered G.* is one of the chief constituents of an empirical medicine known as *The Duke of Portland's Gout Powder.* The bitter principle on which its virtue depends exists also in other species of this genus, probably in all, and appears to be common to many plants of the same order. The roots of *G. purpurea*, *G. punctata*, and *G. Pannonica*, are often mixed with the gentian of commerce. They are deemed inferior. Several species are natives of Britain, but none are at all common except *G. campestris* and *G. amarella*, plants of a few inches in height, with small flowers, both of which are in use as tonics, although only in domestic medicine.—*G. Catesbæi*, a North American species, is extensively used in its native country, as a substitute for Common G., and *G. Kurroo* is employed in the same way in the Himalaya.—Several species of G. are common ornaments of our gardens, particularly *G. acaulis*, a small species with large blue flowers, a native of the continent of Europe and of Siberia, often planted as an edging for flower-borders. Of North American species, *G. crinita* is particularly celebrated for the beauty of its flowers, which are large, blue, and fringed on the margin. It has a branched stem, and grows in wet ground. The brilliancy of the flowers of the small alpine species has led to many attempts to cultivate them, which have generally proved unsuccessful, apparently from the difficulty of imitating the climate and seasons of their native heights.

GENTIANA'CEÆ, or **GENTIANEÆ**, a natural order of exogenous plants, consisting chiefly of herbaceous plants, but containing also a few small shrubs. The leaves are opposite, rarely alternate, destitute of stipules. The flowers are terminal or axillary, generally regular. The calyx is divided usually into 5, sometimes into 4, 6, 8, or 10 lobes; the corolla is hypogynous (q. v.), has the same number of divisions with the calyx, and a plaited or imbricated twisted æstivation. The stamens are inserted upon the corolla, alternate with its segments, and equal to them in number. The ovary is composed of two carpels, 1-celled or imperfectly 2-celled, many-seeded. The fruit is a capsule or berry.—The species are numerous, about 450 being known. They are natives both of warm and cold climates, but rather of elevated regions in the torrid and temperate zones, than of cold regions near the poles. Many have flowers of great beauty, both of colour and form, the corolla being often most delicately fringed. Many are medicinal, as GENTIAN, CHIRATA, FRASERA, BUCKBEAN, and CENTAURY. See these headings.

GENTIANE'LLA, a name sometimes given to the small-flowered or autumnal Gentian (*Gentiana Amarella*), the beautiful blue flowers of which adorn some of the dry pastures of Britain; but more commonly to the species of *Cicendia*, another genus of the order *Gentianaceæ*, of which one (*C. filiformis*, formerly *Exacum filiforme*) is a native of Britain, growing in sandy peat-soils, chiefly in the south-west of England—a small, slender, and graceful plant with yellow flowers. *C. hyssopifolium* is much employed as a stomachic in India.

GENTILLY, a populous village of France, in the metropolitan department of Seine, is situated near Paris, towards the south of that city. The great bastioned wall of Paris passes through the village, separating it into two portions, called Great and Little Gentilly. Pop. 15,000, who are employed in the manufacture of chemicals, in quarrying, and in washing.

GE'NTLEMAN. This word is an example of those compromises so frequent in English between the language introduced by the Normans, and that in possession of the country at the period of the Conquest. The Norman word was, as the French word is now, *gentilhomme*. The first syllable was retained, whilst the second was abandoned in favour of its Saxon equivalent, *man*. Though commonly translated into Latin by GENEROSUS, which means a generous, liberal, manly person, in short, a gentleman, the word gentleman is derived from *gentilis*, and *homo*, or man; and *gentilis* in Latin did not signify gentle, generous, or anything equivalent, but *belonging to a gens*, or known family or clan. See GENS. A gentleman was thus originally a person whose kindred was known and acknowledged; which is the sense in which it is still employed when it is not intended to make any reference to the moral or social qualities of the particular individual. One who was *sine gente*, on the other hand, was one whom no *gens* acknowledged, and who might thus be said to be ignobly born.

The term gentleman is continually confounded with Esquire (q. v.), even by such learned authorities as Sir Edward Coke. But they are not equivalent; and whilst some attempt can be made to define the latter, the former seems in England, from a very early time, to have been a mere social epithet. 'Ordinarily, the king,' says Sir Thomas Smith, 'doth only make knights and create barons, or higher degrees; as for *gentlemen*, they be made good cheap in this kingdom; for whosoever studieth the laws of the realm, who studieth in the universities, who professeth the liberal sciences, and (to be short) who can live idly, and without manual labour, and will bear the port, charge, and countenance of a gentleman, he shall be called Master, for that is the title which men give to esquires and *other gentlemen*, and shall be taken for a gentleman.'—*Commonwealth of England*, i. c. 20. But though such was the real state of matters, even in the beginning of the 17th c., the word was still held to have a stricter meaning, in which it was more nearly synonymous with the French gentilhomme, for in the same chapter the same writer remarks that 'gentlemen be those whom their blood and race doth make noble and known.' Even here, however, it scarcely seems that he considered any connection with a titled family to be necessary to confer the character, for he afterwards speaks of it as corresponding not to nobility, in the English sense, but to *nobilitas*, in the Roman sense, and as resting on 'old riches or powers remaining in one stock.' There can be no doubt that, in still earlier times, patents of gentility were granted by the kings of England. There is one still in existence by Richard II. to John de Kingston, and another by Henry VI. to Bernard Angevin, a Bourdelois. But these patents determine very little, for they seem to have carried the rank and title of esquire; and there is no doubt that esquires, and all persons of higher rank, were held to be gentlemen, on the principle that the greater includes the less. The difficulty is to say whether between an esquire, who certainly was entitled to the character, and a yeoman, who was not, there was an intermediate class who could claim it on any other grounds than courtesy and social usage. These patents corresponded to the modern patents of arms which are issued by the Heralds' Colleges in England and Ireland, and by the Lyon Office in Scotland, and were probably given on the very same grounds—viz., the payment of fees. A patent of arms confers the rank of esquire, and there probably is no other legal mode by which an untitled person can acquire it, unless he be the holder of a dignified office. In present, as in former times, it is common to distinguish between a gentleman by birth and a gentleman by profession and social recognition. By a gentleman born is usually understood either the son of a gentleman by birth, or the grandson of a gentleman by position; but the phrase is loosely applied to all persons who have not themselves 'risen from the ranks.'

GENTLEMA'N-COMMONER. See UNIVERSITY, OXFORD, &c.

GENTLEMEN-AT-ARMS (formerly called the Gentlemen-Pensioners), the body-guard of the British sovereign, and, with the exception of the yeomen of the guard, the oldest corps in the British service. It was instituted in 1509 by Henry VIII., and now consists of 1 captain, who receives £1000 a year; 1 lieutenant, £500; 1 standard-bearer, £310; 1 clerk of the cheque, £120; and 40 gentlemen, each with £70 a year. The pay is issued from the privy purse. Until 1861, the commissions were purchasable, as in other regiments; but by a royal command of that year purchase has been abolished in the corps, and, henceforth, the commissions as gentlemen-at-arms are to be given only to military officers of service and distinction. The attendance of the gentlemen-at-arms is now rarely required, except on the occasions of drawing-rooms, levées, coronations, and similar important state ceremonies. The appointment, which is in the sole gift of the crown, on the recommendation of the commander-in-chief, can be held in conjunction with half-pay or retired full-pay, but not simultaneously with any appointment which might involve absence at the time of the officer's services being required by the sovereign.

GENTOO' (Portuguese, *Gentio*, 'Gentile') was the term applied by old English writers to the natives of Hindustan; it is now entirely obsolete, the word Hindoo, or properly Hindu, having been substituted.

GENUFLE'XION, the act of kneeling or bending the knees in worship. As an act of adoration, or reverence, there are frequent allusions to genuflexion in the Old and in the New Testament: as Gen. xvii. 3 and 17; Numbers xvi. 22; Luke xxii. 41; Acts vii. 60, and ix. 40; Philip. ii. 10. That the use continued among the early Christians is plain from the *Shepherd* of Hermas, from Eusebius's *History*, ii. 33, and from numberless other authorities; and especially from the solemn proclamation made by the deacon to the people in all the liturgies —'Flectamus genua' (Let us bend our knees); whereupon the people knelt, till, at the close of the prayer, they received a corresponding summons —'Levate' (Arise). It is worthy of remark, however, that in celebration of the up-rising (resurrection) of our Lord, the practice of kneeling down at prayer, so early as the age of Tertullian, was discontinued throughout the Easter-time, and on all Sundays through the year. The kneeling posture was especially assigned as the attitude of penance, and one of the classes of public penitents in the early church took their name, *genuflectentes*, from this circumstance. In the modern Roman Catholic Church, the act of genuflexion belongs to the highest form of worship, and is frequently employed during the mass, and in the presence of the consecrated elements when reserved for subsequent communion. In the Anglican Church, the rubric prescribes the kneeling posture in many parts of the service; and this, as well as the practice of bowing the head at the name of Jesus, was the subject of much controversy with the Puritans. The same controversy was recently revived in Germany.

GE'NUS (Lat. a kind), in Natural History, a group of species (q. v.), closely connected by common characters or natural affinity. See Generalisation. In all branches of zoology and botany, the name of the genus forms the first part of the scientific name of each species, and is followed by a second word—either an adjective or substantive—which distinguishes the particular species. Thus, in *Solanum tuberosum* (the potato), *Solanum* is the *generic*, and *tuberosum* the *specific* (sometimes styled the *trivial*) name. This method was introduced by Linnæus, and has been of great advantage to the progress of science, simplifying the nomenclature, and making names serve, in some measure, for the indication of affinities. The affinities indicated by the generic name are often recognised even in popular nomenclature—thus, Elm and *Ulmus* are perfectly synonymous; but there are many instances in which this is very far from being the case, as that of the genus *Solanum*. The arrangement of species in groups called genera has no real relation to any of the important questions concerning species.—Genera are arranged in larger groups called *orders*, which are often variously subdivided into *sub-orders*, *families*, *tribes*, &c.; and are themselves grouped together in *classes*, which are referred to *divisions* of one or other of the *kingdoms* of nature. Some genera contain hundreds of species; others no more than one; and although future discoveries may add to the number in many of the smallest genera, yet it cannot be doubted that a very great difference exists in the number actually belonging to groups equally distinct and natural. Some of the larger genera are, by some authors, divided into sub-genera; and too many naturalists shew an extreme anxiety to multiply generic divisions and names, perhaps forgetting that whilst certain affinities may be thus indicated, the indication of others is necessarily lost, whilst the memory of every student of science is more and more heavily burdened. There can be no doubt, however, that to a certain extent the fluctuations of nomenclature, so often felt to be annoying, mark the progress of science and the removal of errors.

In Mineralogy, the generic name is not adopted as the primary part of the name of each species. *Gem* (q. v.) is an example of a mineralogical genus.

GEOCE'NTRIC means, having the earth for centre; thus the moon's motions are geocentric; also, though no other of the heavenly bodies revolves round the earth, yet their motions are spoken of as geocentric when referred to, or considered as they appear from, the earth.

The geocentric latitude of a planet is the inclination to the plane of the ecliptic of a line connecting it and the earth; the geocentric longitude being the distance measured on the ecliptic from the first point of Aries of the point in the ecliptic to which the planet as seen from the earth is referred.

GE'ODES (Gr. *earthy*) are rounded hollow concretions, or indurated nodules, either empty or containing a more or less solid and free nucleus, and having the cavity frequently lined with crystals. They are sometimes called 'potato stones,' on account of their size and shape. The name *geode* seems to have been given them because they are occasionally found filled with a soft earthy ochre.

GEO'DESY, the science of the measurement of the earth's surface, and of great portions of it. The reader will find under Earth the principal results of geodetical measurements, and under Triangulation, an account of some of the methods of obtaining them. Geodesy has many physical difficulties to contend against. In measuring a particular length with a view to obtaining a base line for calculating other lines by trigonometrical observations, there is first a difficulty arising in the use of the unit of length, whatever it may be, whether rod or chain. In the use of rods, it is difficult to lay them all precisely in the same direction, and to prevent error arising from intervals between the rods. In the use of chains, again, the greatest care is needed to keep all the links stretched, while the difficulty of avoiding error through not preserving the line of direction is but little diminished. Further, in all cases, the tendency of the units to change magnitude with changes of temperature, and the unevenness of the earth's surface, are pregnant sources of error. After all these difficulties have been overcome, and a sufficient base line obtained, a new class of difficulties are encountered. In taking trigonometrical observations of distant objects, it is found that the three angles of any triangle which we may form are together in excess of two right angles; the angles are, in fact, more of the nature of spherical than plane angles. For this, in using the angles as plane angles (for greater simplicity), a correction has to be made. Further, a correction is required for the effect of horizontal refraction on the results of observations on distant objects—a most fluctuating source of error—to evade which, as far as possible, it is usual to make observations when the atmosphere has been for some time undisturbed. See Puissant's work on Geodesy.

GEOFFREY OF MONMOUTH, called also JEFFREY AP ARTHUR, was born at Monmouth, and in 1152 was consecrated Bishop of St Asaph. He died about 1154. His chief work, the *Chronicon sive Historia Britonum*, seems to have been completed about 1128. It is a tissue of the wildest fables, interwoven with some historic traditions. 'In later times,' says Dr Lappenberg, 'authors seem to have unanimously agreed in an unqualified rejection of the entire work, and have therefore failed to observe that many of his accounts are supported by narratives to be found in writers wholly unconnected with, and independent of Geoffrey. He professes to have merely translated his work from a chronicle in the British tongue, called *Brut y Brenhined*, or History of the Kings of Britain, found in Brittany, and communicated to him by Walter, Archdeacon of Oxford [not, as has been supposed, Walter Mapes, but an earlier Walter Calenius]. The *Brut* of Tysilio has, with some probability, been regarded as the original of G.'s work, though it is doubtful whether it may not itself be rather an extract from Geoffrey. That the whole is not a translation appears from passages interpolated, in many places verbatim, from the existing work of Gildus, of whom he cites another work, *De Vita Ambrosii*, no longer extant.' G.'s work was first printed by Ascensius at Paris in 1508, and has been reprinted more than once. An English translation, by Aaron Thompson, appeared at London in 1718, reprinted by Dr Giles in 1842, and in Bohn's Antiquarian Library, 1848. Whatever its value as a historical record, the Chronicle has been of great use to our literature. Versified in the Norman dialect by Wace, and again in English by Layamon, we are indebted to it for the story of Lord Sackville's tragedy of *Ferrex and Porrex*, for Shakspeare's *King Lear*, for some of the finest episodes in Drayton's *Polyolbion*, and for the exquisite fiction of Sabrina in Milton's masque of *Comus*. A metrical *Life and Prophecies of Merlin*, first printed at Frankfurt in 1603, and reprinted for the Roxburghe Club in 1830, has been attributed to Geoffrey of Monmouth, but without sufficient grounds.

GEOFFRIN, MARIE THÉRÈSE, a distinguished Frenchwoman, born at Paris, 2d June 1699. She was the daughter of a valet-de-chambre named Rodet, a native of Dauphiné; and in her fifteenth year was married to a very rich manufacturer in the Faubourg St Antoine, who died not long after, leaving her an immense fortune. Madame G., though but imperfectly educated herself, had a genuine love of learning, and her house soon became a rendezvous of the philosophers and *littérateurs* of Paris. No illustrious foreigner visited the city without obtaining an introduction to her circle; even crowned heads were among her visitors. Her liberality to men of letters, and especially the delicacy with which she conferred her benefits, reflect the highest credit on her character. Among those who frequented her house was Poniatowski, afterwards king of Poland. He announced to her his elevation to the throne in these words: '*Maman, votre fils est roi.*' In 1766, he prevailed on her to visit Warsaw, where she was received with the greatest distinction. Subsequently, in Vienna, the Empress Maria Theresa and her son, Joseph II., honoured her with a most gracious reception. She died in October 1777, leaving legacies to most of her friends. Towards the publication of the *Encyclopédie* she contributed, according to the calculations of her daughter, more than 100,000 francs. D'Alembert, Thomas, and Morellet, wrote éloges upon her, which are to be found in the *Eloges de Madame Geoffrin* (Paris, 1812). Morellet likewise published her treatise *Sur la Conversation*, and her *Lettres*.

GEOFFROY SAINT-HILAIRE, ETIENNE, a French zoologist and physiologist, was born at Etampes in 1772, and died at Paris in 1844. He was destined by his family for the clerical profession, and was sent to prosecute his studies at the College of Navarre, where he attended the lectures of Brisson, who speedily awakened in him a taste for the natural sciences. He subsequently became a pupil of Haüy (q. v.) and of Daubenton; and the relations which were soon established between his masters and himself were attended with the happiest results to science, since they decided the future prospects of G., and saved the life of Haüy, who had been imprisoned as a refractory priest, and whom G. rescued from prison on the very eve of the massacres of September 1792. A few months afterwards, Haüy obtained for him the post of sub-keeper and assistant-demonstrator at the Jardin des Plantes; and in June 1793, on the reorganisation of the institution, he was nominated professor of the zoology of vertebrated animals. At first, he refused to accept the chair, on the ground that all his studies had been directed to mineralogy; but he finally yielded to the urgent persuasion of his old master Daubenton, and at once set resolutely to work. At this time, he was only 21 years of age.

Immediately after his installation, he commenced the foundation of the menagerie at the Jardin des Plantes, its beginning being three itinerant collections of animals that had been confiscated by the police, and were conveyed to the museum. All the departments of the museum over which he had charge soon exhibited signs of his vigorous administration; and the zoological collection became the richest in the world.

In 1795, G. having heard from the Abbé Tessier that he had found a young man in the wilds of Normandy who was devoting all his leisure time to natural history, and having subsequently received from the stranger a communication containing some account of his investigations, wrote thus to his unknown correspondent: 'Come to Paris without delay; come and assume the place of a new Linnæus, and become another founder of natural history.' It was thus that Georges Cuvier was called to Paris by the prophetic summons of Geoffroy. An intimate friendship was soon established between them, which, although long afterwards broken by the asperity of scientific discussion, was finally revived with all its original warmth in their later days.

In 1798, G. formed one of the scientific commission that accompanied Bonaparte to Egypt, and he remained in that country until the surrender of Alexandria in 1801. He succeeded in bringing to France valuable collections of natural history specimens; and the Memoirs in which he described them led to his election, in 1807, into the Academy of Sciences. In 1808, he was charged with a scientific mission to Portugal, the object of which was to obtain from the collections in that kingdom all the specimens which were wanting in those of France. On his return, he was appointed to the professorship of zoology in the Faculty of Science at Paris, and from that time he undertook no more expeditions, but devoted himself almost exclusively to science. In the latter years of his life, he was stricken with total blindness, but the physical repose to which he was consequently condemned, seemed to increase his intellectual activity; and to the very last days of his life, he was occupied with those abstruse questions of biology which had influenced his whole scientific career. Throughout almost all his writings, we find him endeavouring to establish one great proposition—namely, the unity of the organic plan of the animal kingdom. This was the point on which he and Cuvier mainly differed, and on which there were very warm discussions between these two eminent naturalists in the Academy of Sciences in 1830. In addition to numerous memoirs in various scientific periodicals, he published various works, amongst which we may mention his *Philosophie Anatomique* (2 vols. 1818—1820), which contains the exposition of his theory; *Principes de la Philosophie Zoologique* (1830), which gives a synopsis of his discussions with Cuvier; *Études Progressives d'un Naturaliste* (1835); *Notions de Philosophie Naturelle* (1838); and (in conjunction with Frédéric Cuvier), *Histoire Naturelle des Mammifères* (3 vols. folio, 1820—1842). His son has published an excellent history of his life and labours, under the title, *Vie, Travaux, et Doctrine Scientifique d'E. Geoffroy Saint-Hilaire* (1848), to which, as well as to *L'Éloge Historique de Geoffroy Saint-Hilaire* by Flourens, we are indebted for many of the details contained in this sketch. We may also refer to a very able sketch of the life and doctrines of this great naturalist, in the Appendix to De Quatrefages's *Rambles of a Naturalist*, vol. i. pp. 312—324.

GEOFFROY SAINT-HILAIRE, ISIDORE, a French physiologist and naturalist, son of Etienne Geoffroy, was born in Paris in 1805, and died in that city in 1861. Educated in natural history by his father, he became assistant naturalist at the museum when only 19 years of age, and in 1830 he delivered the zoological lectures in that institution as his father's substitute. The science of Teratology (q. v.), or of the laws which regulate the development of monstrosities, which had occupied much of his father's attention, was taken up with great zeal by the son, and in 1832 he published the first volume of his *Histoire Générale et Particulière des Anomalies de l'Organisation chez l'Homme et les Animaux, ou Traité de Tératologie*, the third and concluding volume of which did not appear till 1837. This work is of extreme value, and will always serve as the starting-point for those who may occupy themselves with this important branch of biological investigation. Having for a long time the superintendence of the menagerie of the museum, he was led to study the domestication of foreign animals in France; and the results of these investigations may be found in his *Domestication et Naturalisation des Animaux Utiles* (1854), and especially in the *Société pour l'Acclimatation des Animaux Utiles*, of which he was the founder. In 1852, he published the first volume of a great work entitled, *Histoire Générale des Règnes Organiques*, in which he intended to develop the doctrines handed down to him by his father, but which is left in an unfinished state by his premature death. He was a strong advocate of the use of horse-flesh as human food, and published his *Lettres sur les Substances Alimentaires, et particulièrement sur la Viande de Cheval* (1856), with the view of bringing his views on the subject before the general public.

GEO'GNOSY (*gē*, the earth; *gnōsis*, knowledge) is a term now little used by British writers, but still employed in Germany as a synonym of geology, or, more properly, as restricted to the observed facts of geology, apart from reasonings or theories built upon them. The geognost examines the nature and position of the rocks of a country, without grouping them together in the order of succession. Of necessity, geognosy preceded geology; it was indeed geology in its early empirical condition, when it consisted merely of a record of observed facts; but as soon as these assumed a scientific form, and were arranged into a system, then geognosy disappeared; for even in the examination of new and unexplored territories, the data supplied by the science of geology enable us to refer the strata with certainty to their true chronological position.

The word has also been employed to designate that department of geology which treats of the physical characteristics of rocks; that is, of their chemical composition, internal structure, planes of division, position and other properties, and peculiarities belonging to them simply as rocks.

GEOGRA'PHICAL DISTRIBU'TION OF ANIMALS. Each great geographical or climatal region of the globe is occupied by some species of animals not found elsewhere. Thus, the ornithorhynchus belongs exclusively to New Holland; the sloth, to America; the hippopotamus and camelopard, to Africa; and the reindeer and walrus, to the arctic regions; and each of these animals, when left in its natural freedom, dwells within certain limits, to which it always tends to return, if removed by accident or design. A group of animals inhabiting any particular region, and embracing all its species, both aquatic and terrestrial, is called its FAUNA (q. v.), just as the collective plants of a country are termed its FLORA. There is a close and obvious connection between the fauna of any place and its temperature, although countries with similar climates are not always inhabited by similar animals; and the soil and vegetation are likewise important factors in determining the characters of any special fauna.

The influence of climate is well seen in the distribution of animals in the arctic regions. The same animals inhabit the northern polar regions of Europe, Asia, and America. Thus, for example, the polar bear, whales, seals, and numerous birds, are common to the northern regions of these three continents. In the temperate regions, on the other hand, the types remain the same, but they are represented by different species, which still, however, retain the same general features. These general resemblances often led our early American colonists erroneously to apply the names of European species to the similar, but not identical animals of the New World. Similar differences occur in distant regions of the same continent, within the same parallel of latitude. Thus, as Professor Agassiz has remarked, the animals of Oregon and of California are not the same as those of New England; and the difference, in some respects, is even greater than between the animals of New England and Europe; and similarly, the animals of temperate Asia differ more from those of Europe, with which they are continuous, than they do from those of America, from which they are separated by a large surface of ocean.

Under the torrid zone, we not only find animals different from those occurring in temperate regions, but we likewise meet with a fauna which presents the greatest variety amongst the individuals which constitute it. 'The most gracefully proportioned forms,' says Agassiz, 'are found by the side of the most grotesque, decked with every combination of brilliant colouring. At the same time, the contrast between the animals of different continents is more marked; and in many respects, the animals of the different tropical faunas differ not less from each other than from those of the temperate or frozen zones; thus, the fauna of Brazil varies as much from that of Central Africa as from that of the Southern United States. This diversity in different continents cannot depend simply upon any influence of the climate of the tropics; if it were so, uniformity ought to be restored in proportion as we recede from the tropics towards the antarctic temperate region. But instead of this, the differences continue to increase—so much so, that no faunas are more in contrast than those of Cape Horn, the Cape of Good Hope, and New Holland. Hence, other influences must be in operation besides those of climate, &c.—influences of a higher order, which are involved in a general plan, and intimately associated with the development of life on the surface of the earth.' If space permitted, we might point out the influence of the natural features of the earth's surface in limiting and separating faunas. A mountain chain or a desert may act as effectually as the depths of ocean in separating one fauna from another. When no such obstacles exist, one fauna gradually merges into another, without any definite line of demarcation.

The powers of locomotion possessed by different animals have not—as we might have supposed—any apparent influence on the extent of country over which they range. On the contrary, animals whose locomotive powers are extremely small, as, for example, the common oyster, have a far greater range than some of our fleet animals, such as the moose.

'The nature of their food has an important bearing upon the grouping of animals, and upon the extent of their distribution. Carnivorous animals are generally less confined in their range than herbivorous ones, because their food is almost everywhere to be found. The herbivora, on the other hand, are restricted to the more limited regions corresponding to the different zones of vegetation.' Similarly, birds of prey, like the eagle and vulture, have a much wider range than the granivorous and gallinaceous birds; but even the birds that wander furthest, have their definite limits; for example, the condor of the Cordilleras, although, from the extreme heights at which he is often seen, he cannot fear a low temperature, is never found in the temperate region of the United States.

A very influential factor is the distribution of aquatic animals in the depths of water. The late Professor Forbes distinctly shewed that we may recognise distinct faunas in zones of different depth, just as we mark different zones of animal and vegetable life in ascending lofty mountains. The zoophytes, molluscs, and even fishes, found near the shore in shallow water, usually differ very materially from those living at the depth of 20 or 30 feet; and these, again, are different from those which are met with at a greater depth. The extreme depth at which animal life, in its lower forms, ceases to exist, is unknown; late researches of Dr Wallich and Alphonse Milne Edwards shew, however, from the evidence of deep-sea soundings, and of pieces of telegraph wire raised from great depths, that the region of animal life extends *bathymetrically* (to use Professor Forbes's word) further than was anticipated.

Before concluding these general remarks, we must observe that occasionally one or more animals are found in one very limited spot, and nowhere else; as, for example, the chamois and the ibex upon the Alps. (On this point, the reader should consult Darwin's *Journal of Researches*, &c., in which it is shewn that the Galapagos Archipelago, consisting of a small group of islands situated under the equator, and between 500 and 600 miles westward of the coast of America, not only contain numerous animals and plants that are found in no other part of the world, but that many of the species are exclusively confined to a single island.)

All the faunas of the globe may be divided into three great groups, corresponding to the three great climatal divisions—viz., the Arctic or Glacial, the Temperate, and the Tropical Faunas, while the two last-named faunas may be again divided into several zoological provinces. Each of these primary divisions demands a separate notice.

ARCTIC FAUNA.—The limits of this fauna are easily fixed, as we include within them all animals living beyond the line where forests cease, and are succeeded by vast arid plains, known as barren lands, or *tundras*. Though the air-breathing species are not numerous here, the large number of individuals compensates for this deficiency, and among the marine animals we find an astonishing profusion and variety of forms. The larger mammals which inhabit this zone are the white bear, the walrus, numerous species of seal, the reindeer, the musk-ox, the narwal, the cachalot, and whales in abundance. Among the smaller species, we may mention the white fox, the polar hare, and the lemming. Some marine eagles and a few wading birds are found; but the aquatic birds of the family of Palmipedes (the web-footed birds), such as the gannets, cormorants, penguins, petrels, ducks, geese, mergansers, and gulls, abound in almost incredible profusion. No reptile is known in this zone. Fishes are very numerous, and the rivers especially swarm with a variety of species of the salmon family. The Articulata are represented by numerous marine worms, and by minute crustaceans of the orders *Isopoda* and *Amphipoda;* insects are rare, and of inferior types (only six species of insects were observed in Melville Island during Parry's residence of eleven months there). Only the lowest forms of mollusca are found, viz., *Tunicata* and *Acephala*, with a few *Gasteropoda*, and still fewer *Cephalopoda*. The *Radiata* are represented by numerous jelly-fishes (especially the beröe), by several star-fishes and echini, and by very few polypes.

With this fauna is associated a peculiar race of men, known in America under the name of Esquimaux (q. v.), and in the Old World under the names of Laps, Samoyedes, and Tchuktsches. 'This race,' says Agassiz, 'differs alike from the Indians of North America, from the whites of Europe, and the Mongols of Asia, to whom they are adjacent. The uniformity of their characters along the whole range of the arctic seas, forms one of the most striking resemblances which these people exhibit to the fauna with which they are so closely connected.'

TEMPERATE FAUNAS.—To the glacial zone, which encloses a single fauna, succeeds the temperate zone, included between the isothermes (or lines of equal mean temperature) of 32° and 74°, characterised by its pine-forests, its maples, its walnuts, and its fruit-trees, and inhabited by the terrestrial bear, the wolf, the fox, the weasel, the marten, the otter, the lynx, the horse and ass, the boar, numerous genera and species of deer, goats, sheep, oxen, hares, squirrels, rats, &c.; and southwards by a few representatives of the tropical zone. Considering the whole range of the temperate zone from east to west, Agassiz divides it, in accordance with the prevailing physical features, into—1st, the *Asiatic* realm, embracing Mantchuria, Japan, China, Mongolia, and passing through Turkestan into, 2d, the *European* realm, which includes Iran, Asia Minor, Mesopotamia, Northern Arabia and Barbary, as well as Europe properly so called; the western parts of Asia and the northern parts of Africa being intimately connected by their geological structure with the southern part of Europe; and 3d, the *North American* realm, which extends as far south as the table-land of Mexico.

The temperate zone is not characterised, like the arctic, by one and the same fauna. Not only are the animals different in the eastern and western hemispheres, but there are differences in the various regions of the same hemisphere: as we before remarked, the species resemble, but are not identical with one another. Thus, in Europe, we have the brown bear; in North America, the black bear; and in Asia, the bear of Tibet; the common stag or red deer of Europe is represented in North America by the Canadian stag or wapiti and the American deer, and in Eastern Asia by the musk-deer; the North American buffalo is represented in Europe by the wild aurochs of Lithuania, and in Mongolia by the yak; and numerous other examples might readily be given.

The marked changes of temperature between the different seasons occasion migrations of animals more in this zone than any other, and this point must not be overlooked by the naturalist in determining the fauna of a locality within it. Many of the birds of Northern Europe and America, in their instinctive search for a warmer winter climate, proceed as far southward as the shores of the Mediterranean and of the Gulf of Mexico. See Migrations of Animals.

Amongst the most characteristic of the animals of the *Asiatic* realm, we may mention the bear of Tibet, the musk-deer, the tzeiran (*Antilope gutturosa*), the Mongolian goat, the argali, the yak, the Bactrian or double-hunched camel, the wild horse, the wild ass, and another equine species, the dtschigetai (*Equus hemionus*). The nations of men inhabiting these realms all belong to the so-called Mongolian race.

That the *European* is a distinct zoological realm, seems to be established, says Agassiz, 'by the range of its mammalia, and by the limits of the migrations of its birds, as well as by the physical features of its whole extent. Thus we find its deer or stag, its bear, its hare, its squirrel, its wolf and wild cat, its fox and jackal, its otter, its weasel and marten, its badger, its bear, its mole, its hedgehogs, its bats, &c. Like the eastern realm, the European world may be subdivided into a number of distinct faunas, characterised each by a variety of peculiar animals. In Western Asia, we find, for instance, the common camel instead of the Bactrian; whilst Mount Sinai, Mounts Taurus and Caucasus, have goats and wild sheep which differ as much from those of Asia as from those of Greece, the Alps, the Atlas, or of Egypt.' There is no reason for our referring, as many writers have done, our chief domesticated animals to an Asiatic origin. A wild horse, different in species from the Asiatic breeds, once inhabited Spain and Germany, and a wild bull existed over the whole range of Central Europe. The domesticated cat, whether we trace it to *Felis maniculata* of Egypt or to *Felis catus* (the wild cat) of Central Europe, belongs to this realm; and whatever theory be adopted regarding the origin of the dog, the European realm forms its natural range. The merino sheep is still represented in the wild state by the mouflon of Sardinia, and formerly ranged over all the mountains in Spain. The hog is descended from the common boar, still found wild over most of the temperate zone of the Old World. Ducks, geese, and pigeons have their wild representatives in Europe. The common fowl and the turkey are, on the other hand, not indigenous, the former being of East Asiatic, and the latter of American origin. The reader will observe that the European zoological realm is circumscribed within exactly the same limits as the so-called white race of man.

The *American* realm contains many animals not found in Europe or Asia, amongst which we may mention the opossum; several species of insectivora, as, for example, the shrew-mole (*Scalops aquaticus*) and the star-nosed mole (*Condylura cristata*), several species of rodents (especially the musk-rat), the Canadian elk, &c., in the northern portion; and the prairie-wolf, the fox-squirrel, &c., in the southern portion of the fauna. Amongst other types characteristic of this zone must be reckoned the snapping-turtle among the tortoises; the *Menobranchus* and *Menopoma* among the salamanders; and the rattlesnake among the serpents; and the *Lepidosteus* and the *Amia*, important representatives of two almost extinct families, among the fishes.

The faunas of the southern temperate region differ from one another more than those of the corresponding northern region. 'Each of the three continental peninsulas jutting out southerly into the ocean represents, in some sense, a separate world. The animals of South America beyond the tropic of Capricorn are in all respects different from those at the southern extremity of Africa. The hyenas, wild boars, and rhinoceroses of the Cape of Good Hope have no analogies on the American continent; and the difference is equally great between the birds, reptiles, fishes, insects, and molluscs. New Holland, with its marsupial mammals, with which are associated insects and molluscs no less singular, furnishes a fauna still more peculiar, and which has no similarity to those of any of the adjacent countries. In the seas of that continent, we find the curious shark, with paved teeth and spines on the back (*Cestracion Philippii*), the only living representative of a family so numerous in former zoological ages.'

Tropical Faunas are distinguished in all the continents by the immense variety of animals which they contain, and in many cases by the brilliancy of their colour. Not only are all the principal types of animals represented, but genera, species, and individuals occur in abundant profusion. The tropical is the region of the apes and monkeys (which seem to be naturally associated with the distribution of the palms, which furnish to a great extent the food of the monkeys on both continents), of herbivorous bats, of the great pachyderms, such as the elephant, the hippopotamus, and the tapir, and of the whole family of edentata. Here, too, are the largest of the cats, the lion and the tiger. Among birds, the parrots and toucans are essentially tropical; amongst the reptiles, the largest serpents, crocodiles, and tortoises belong to this zone, as also do the most gorgeous insects. The marine fauna is also superior in beauty, size, and number to those of other regions. The tropical fauna of each continent furnishes new and peculiar forms. Sometimes whole types are restricted to one continent, as the sloths, the toucans, and the humming-birds to America; the gibbons, the red orang, the royal tiger, and numerous peculiar birds to Asia; and the giraffe and hippopotamus to Africa: while sometimes animals of the same group present different characteristics on different continents. Thus, for example, the American monkeys have flat and widely separated nostrils, thirty-six teeth, and generally a long prehensile tail; while the monkeys of the Old World have their nostrils close together, only thirty-two teeth, and non-prehensile tails.

The island of Madagascar has its peculiar fauna. A large number of species of quadrumana, cheiroptera, insectivora, &c., are found only in this island; and of 112 species of birds that have been described, 65, or more than half, are found nowhere else. We have already referred to the still more exclusive fauna of the Galapagos Islands, which has been specially studied by Darwin.

From a general survey of such facts as we have given in a very condensed form in the preceding columns, Agassiz draws the following conclusions:

1. Each grand division of the globe has animals which are either wholly or for the most part peculiar to it.
2. The diversity of faunas is not in proportion to the distance that separates them. Very similar faunas are found at great distances apart, while very different faunas are found at comparatively short distances.
3. There is a direct relation between the richness of a fauna and the climate, and likewise between the fauna and the flora; the limit of the former being oftentimes determined, so far as terrestrial animals are concerned, by the extent of the latter.
4. The distribution of animals cannot (any more than their organisation) be the effect of external influences, but is the realisation of a wisely designed plan, by which each species of animal was originally created *at* the place and *for* the place which it inhabits. The only way to account philosophically for the distribution of animals as we now find them, is to regard them as *autochthonoi*—that is to say, as originating on the soil where they exist. There is not a single fact in favour of, indeed, all scientific observations are in direct opposition to the view, that the whole animal world was created in one single centre.

For further details on this subject, we may refer to the various works of Agassiz, of which we have made free use in the compilation of this article; to Vogt's *Zoologische Briefe*, vol. ii.; Mrs Somerville's *Physical Geography*, vol. ii.; Maury's *La Terre et l'Homme;* Klöden's *Handbuch der Physischen Geographie;* and especially to Schmarda's great work on the subject, entitled *Die Geographische Verbreitung der Thiere.*

GEOGRAPHICAL DISTRIBUTION OF PLANTS, also called GEOGRAPHICAL BOTANY, and PHYTOGEOGRAPHY, is that branch of botany which treats of the geographic distribution of plants, and connects botany with physical geography. A knowledge of facts belonging to it has been gradually accumulating ever since the science of botany began to be studied, but its importance was little understood until very recent times. Humboldt may be said to have elevated it to the rank which it now holds as a distinct branch of science. It was indeed impossible for botany to be studied without attention being arrested by the great diversity of the productions of different countries, and even of those not very dissimilar in climate. But it was long ere important generalisations were attempted; and a large accumulation of particular facts was in the first place necessary. Even to this day, the deficiency of information concerning the botany of wide regions is painfully felt.

Every climate has plants particularly adapted to it. The plants of the tropics will not grow in frigid, nor generally even in temperate regions; as little will arctic or subarctic plants endure the heat of the torrid zone. And as the climate changes with the elevation above the level of the sea, the mountains of tropical countries have a flora analogous to that of the temperate, and even of the frigid zones. The vegetation of every place bears a relation to its mean annual temperature. But owing to the peculiarities of different plants, it bears also important relations to the mean temperatures of the summer and winter months; and thus great diversities are found not only in the indigenous vegetation of countries very similar in their mean annual temperature, but even in their suitableness for plants which may be introduced into them by man. Nor is temperature the only thing of importance in the relations of climate to vegetation. Moisture must be ranked next to it. Some plants flourish only in a dry, and some only in a humid atmosphere. The flora of the very dry regions of Africa and of Australia is almost as notably different from that of moist countries in similar latitudes, as that of the temperate from that of the torrid zone. Nor is the difference merely in the species of plants produced, but in the whole character of the vegetation, which very much consists either of succulent plants with thick epidermis, or of plants with hard and dry foliage.

Much depends also on soil. Sandy soils have their peculiar vegetation; peat is also favourable to the growth of many plants which are seldom or never to be found in any other soil. The chemical constitution of soils determines to some extent the character of their flora; and therefore certain plants are almost exclusively to be found in districts where certain rocks prevail, and a relation is established between botany and geology. Limestone districts, for example, have a flora differing to a certain extent from other districts even of the same vicinity. Some British plants are almost entirely limited to the chalk districts. The other physical qualities of the soil are not unimportant. Light soils are suitable to plants with fine roots divided into many delicate fibrils, as heaths, which will scarcely grow in stiff clay.

Some groups of plants are almost entirely limited to peculiar situations, as the *Algæ* and other smaller groups of *aquatic* plants. Some are exclusively tropical; others are only found in the colder parts of the world; and if any of the group occur within the tropics, it is on mountains of considerable elevation. But besides all this, and apart from all obvious differences of climate, soil, &c., some groups of plants, and these often containing many species, are only or chiefly found in certain parts of the world. Thus the *Cactaceæ* are exclusively American; whilst of the numerous species of Heath (*Erica*), not one is indigenous to America, although many other plants of the Heath family (*Ericeæ*) are so. Sometimes the plants which chiefly abound in one part of the world seem to be replaced by other but similar species, sometimes by those of another group, in another part of the world, with similar physical characteristics. Thus *Mesembryaceæ* and *Crassulaceæ* seem in some countries to occupy the place of the American *Cactaceæ*, whilst the black-fruited Crowberry (*Empetrum*) of the northern parts of the world finds a representative in a red-fruited species, extremely similar, in the southern parts of South America. Of many groups which chiefly belong to certain climates or certain parts of the world, there are yet species which wander, as it were, into very different climates or remote parts of the world; these species being often, however, unknown where the other species of the group abound. Thus the common periwinkle is a northern wanderer of a family mostly tropical. Some groups are common to parts of the world widely remote, and their prevalence is characteristic of these parts, as *Rhododendrons* and *Magnoliaceæ* of North America and of the mountainous districts of the East Indies, although the American and the Asiatic species are not the same. Some species are believed to exist only within a very narrow range; others are very widely diffused. A few are found in the colder parts both of the northern and southern hemispheres, and also on the intervening tropical mountains. Some groups also, containing many species, are confined to particular regions, as the important *Cinchonæ* to a district of the Andes, and the *Calceolariæ* to higher parts of the same mountain chain.—Marine vegetation, like terrestrial vegetation, has species and groups that are very generally diffused, and others confined to particular regions.

The geographical limits of species have no doubt been in many instances unintentionally modified by man, and the extent of this modification it is extremely difficult to ascertain. There is enough, however, in the known facts of botanical geography, evidently independent of such agency, to afford foundation for interesting and important speculations, of which some notice will be taken under the head Species.

Many of the principal facts of botanical geography will be found stated in the articles Europe, Asia, America, and Australia, and in articles on natural orders and genera of plants. Schouw and Meyen are among the chief authorities on this subject; and the former has endeavoured to divide the earth into 25 botanical regions, characterised by the prevalence of particular forms of vegetation. The reader will find much information on botanical geography, collected in a very accessible form, in the *Physical Atlas* of Johnston and Berghaus.—Henfrey's *Vegetation of Europe* (Van Voorst, London, 1852) may be consulted with advantage; and the *Cybele Britannica*, and *Geography of British Plants*, of Mr H. C. Watson, treating of the geographic distribution of plants in the British Isles, are unrivalled among works of its kind.

GEO'GRAPHY (Gr. *gē*, the earth, *graph-*, to write or describe) is, as its name implies, a description of the earth. This science is best considered under the three distinct heads of *Mathematical* or *Astronomical* Geography, *Physical* Geography, and *Political* Geography, which all admit of further subdivision into numerous subsidiary branches.

Mathematical or *Astronomical* Geography describes the earth in its planetary relations as a member of the solar system, influencing and influenced by other cosmical bodies. It treats of the figure, magnitude, and density of the earth; its motion, and the laws by which that motion is governed; together with the phenomena of the movements of other cosmical bodies, on which depend the alternation of day and night, and of the seasons of the year, and the eclipses and occultations of the sun, moon, and planets; it determines position, and estimates distances on the earth's surface, and teaches methods for the solution of astronomical problems, and the construction of the instruments necessary for such operations, together with the modes of representing the surface of the earth by means of globes, charts, and maps. The numerous subjects comprised in this portion of geographical science will be found in other parts of the present work, and we therefore refer our readers for further particulars to the several articles in which they are more fully treated, as, for instance, Astronomy, Latitude and Longitude, Mathematical Instruments, Observatories, &c.

Physical Geography, as the name indicates, considers the earth in its relation to nature and natural or physical laws only. It describes the earth, air, and water, and the organised beings, whether animal or vegetable, by which those elements are occupied, and considers the history, extent, mode, and causes of the distribution of these beings. This may be regarded as the most important branch of geographical science, since it involves the consideration and study of phenomena, which not only tend to further the material interests of man, by teaching him how best to promote the development of the products of nature, but also conduce in no inconsiderable degree to general intellectual advance, by stimulating the faculties of observation, and exercising the powers of thought. The vast sphere of inquiry included in physical geography necessarily embraces the consideration of all the natural sciences generally, and we can here, therefore, merely refer our readers for more special information regarding the details of the subject to such articles as Climate, Heat, Lakes, Rivers, Mountains, Ocean, Winds, Rain, Clouds; Ethnology, Geographical Distribution of Animals and Plants, &c.

Political Geography has been well defined as 'including all those facts which are the immediate consequences of the operations of man, exercised either on the raw materials of the earth, or on the means of his intercourse with his fellow-creatures.' Thus considered, it embraces, primarily, the description of the political or arbitrary divisions and limits of empires, kingdoms, and states; and, secondarily, that of the laws, modes of government, and social organisation which prevail in the several countries. The details of this branch of geography will be found under the names of countries, cities, &c., while more general information in regard to the subject must be sought from historical, political, and statistical sources.

Before proceeding to sketch the progress and history of geographical discovery, we will indicate a few of the leading works that afford the best aid in studying the three main branches of geography to which we have referred. Thus, for instance, in Mathematical Geography, we would specially instance: *Manual of Geographical Science* (Part I. *Mathematical Geography*, by Mr O'Brien); Herschel's *Outlines of Astronomy;* Klöden's *Erdkunde* (Part I.): in Physical Geography, Ritter's *Erdkunde;* Klöden's; A. Maury's *La Terre et l'Homme;* Mrs Somerville's *Physical Geography;* Mr F. Maury's *Physical Geography of the Sea*, &c.: while in regard to Political Geography, information may be sought from the great works of Ritter, Berghaus, Stein, Wappäus, and Klöden, and from the ordinary geographical manuals and maps.

Geographical Discovery.—The earliest idea formed of the earth by nations in a primeval condition seems to have been that it was a flat circular disc, surrounded on all sides by water, and covered by the heavens as with a canopy, in the centre of which their own land was supposed to be situated. The Phœnicians were the first people who communicated to other nations a knowledge of distant lands; and although little is known as to the exact period and extent of their various discoveries, they had, before the age of Homer, navigated all parts of the Euxine, and penetrated beyond the limits of the Mediterranean into the Western Ocean, and they thus form the first link of the great chain of discovery which, 2500 years after their foundation of the cities of Tartessus and Utica, was carried by Columbus to the remote shores of America. Besides various settlements nearer home, these bold adventurers had founded colonies in Asia Minor about 1200 B.C., and a century later they laid the foundation of Gades, Utica, and several other cities, which was followed, in the course of the 9th c. by that of Carthage, from whence new streams of colonisation continued for several centuries to flow to hitherto unknown parts of the world. The Phœnicians, although less highly gifted than the Egyptians, rank next to them in regard to the influence which they exerted on the progress of human thought and civilisation, for their knowledge of mechanics, their early use of weights and measures, and what was of still greater importance, their employment of an alphabetical form of writing, facilitated and confirmed commercial intercourse among their own numerous colonies, and formed a bond of union which speedily embraced all the civilised nations of Semitic and Hellenic origin. So rapid was the advance of geographical knowledge between the age of the Homeric poems (which may be regarded as representing the ideas entertained at the commencement of the 9th c. B.C.) and the time of Hesiod (800 B.C.), that while in the former the earth is supposed to resemble a circular shield, surrounded by a rim of water, spoken of as the parent of all other streams, and the names of Asia and Europe applied only, the former to the upper valley of the Caïster, and the latter to Greece north of Peloponnesus, Hesiod mentions parts of Italy, Sicily, Gaul, and Spain, and is acquainted with the Scythians, and with the Ethiopians of Southern Africa. During the 7th c. B.C., certain Phœnicians, under the patronage of Neku or Necho II. king of Egypt, undertook a voyage of discovery, and are supposed to have circumnavigated Africa. This expedition is recorded by Herodotus, who relates that it entered the Southern Ocean by way of the Red Sea, and after three years' absence, returned to Egypt by the Pillars of Hercules. The fact of an actual circumnavigation of the African continent has been doubted, but the most convincing proof of its reality is afforded by the observation which seemed incredible to Herodotus, viz., 'that the mariners who sailed round Libya (from east to west) had the sun on their right hand.' The 7th and 6th centuries B.C. were memorable for the great advance made in regard to the knowledge of the form and extent of the earth. Thales, and his pupil Anaximander, reputed to have been the first to draw maps, exploded many errors, and paved the way, by their observations, for the attainment of a sounder knowledge. The logographers contributed at this period to the same end by the descriptions which they gave of various parts of the earth; of these, perhaps the most interesting to us is the narrative of the Carthaginian Himilco, who discovered the British Islands, including the Œstrymnides, which he described as being a four months' voyage from Tartessus.

With Herodotus of Halicarnassus (born 484 B.C.), who may be regarded as the father of geography as well as of history, a new era began in regard to geographical knowledge, for although his chief object was to record the struggles of the Greeks and Persians, he has so minutely described the countries which he visited in his extensive travels (which covered an area of more than 31° or 1700 miles from east to west, and 24° or 1660 miles from north to south), that his History gives us a complete representation of all that was known of the earth's surface in his age. This knowledge, which was extremely scanty, consisted in believing that the world was bounded to the south by the Red Sea or Indian Ocean, and to the west by the Atlantic, while its eastern boundaries, although admitted to be undefined, were conjectured to be nearly identical with the limits of the Persian empire, and its northern termination somewhere in the region of the amber-lands of the Baltic, which had been visited by Phœnician mariners, and with which the people of Massilia (the modern Marseille) kept up constant intercourse by way of Gaul and Germany. In the next century, the achievements of Alexander the Great tended materially to enlarge the bounds of human knowledge, for while he carried his arms to the banks of the Indus and Oxus, and extended his conquests to Northern and Eastern Asia, he at the same time promoted science, by sending expeditions to explore and survey the various provinces which he subdued, and to make collections of all that was curious in regard to the organic and inorganic products of the newly visited districts; and hence the victories of the Macedonian conqueror formed a new era in physical inquiry generally, as well as in geographical discovery specially. While Alexander was opening the East to the knowledge of western nations, Pytheas, an adventurous navigator of Massilia, conducted an expedition past Spain and Gaul through the Channel, round the east of England into the Northern Ocean, where, after six days' sailing, he reached Thule (conjectured to be Iceland), and returning, passed into the Baltic, where he heard of the Teutones and Goths. Discovery was thus being extended both in the north and east into regions whose very existence had never been suspected, or which had hitherto been regarded as mere chaotic wastes. An important advance in geography was made by Eratosthenes (born 276 B.C.), who first used parallels of longitude and latitude, and constructed maps on mathematical principles. Although his work on geography is lost, we learn from Strabo that he considered the world to be a sphere revolving with its surrounding atmosphere on one and the same axis, and having one centre. He believed that only about one-eighth of the earth's surface was inhabited, while the extreme points of his habitable world were Thule in the north, China in the east, the Cinnamon Coast of Africa in the south, and the Prom. Sacrum (Cape St Vincent) in the west. During the interval between the ages of Eratosthenes and Strabo (born 66 B.C.), many voluminous works on geography were compiled, which have been either wholly lost to us, or only very partially preserved in the records of later writers. Strabo's great work on geography, which is said to have been composed when he was eighty years of age, has been considered as a model of what such works should be in regard to the methods of treating the subject; but while his descriptions of all the places he has himself visited are interesting and instructive, he seems unduly to have discarded the authority of preceding writers.

The wars and conquests of the Romans had a most important bearing upon geography, since the practical genius of the Roman people led them to the study of the material resources of every province and state brought under their sway, and the greatest service was done to geographical knowledge by the survey of the empire, which was begun by Julius Cæsar, and completed by Augustus. This work comprised a description and measurement of every province by the most celebrated geometricians of the day. Pliny (born 23 A.D.), who had travelled in Spain, Gaul, Germany, and Africa, has left us a compendium of the geographical and physical science of his age in the four books of his *Historia Naturalis* which he devotes to the subject. He collected with indefatigable industry the information contained in the works of Sallust, Cæsar, Tacitus, and others, to which he added the results of his own observations, without, however, discriminating between fact and fiction. The progress that had been made since Cæsar's time in geographical knowledge is evinced by Pliny's notice of arctic regions and of the Scandinavian lands, and the accounts which he gives of Mount Atlas, the course of the Niger, and of various settlements in different parts of Africa; while his knowledge of Asia is more correct than that of his predecessors, for he correctly affirms that Ceylon is an island, and not the commencement of a new continent, as had been generally supposed. The study of geography in ancient times may be said to have terminated with C. Ptolemy, who flourished in the middle of the 2d c. of our era. His work on Geography, in eight books, which continued to be regarded as the most perfect system of the science through the dark and middle ages down to the 16th c., gives a tolerably correct account of the well-known countries of the world, and of the Mediterranean, Euxine, and Caspian, together with the rivers which fall into those seas, but it added little to the knowledge of the north of Europe, or the extreme boundaries of Asia or Africa. Yet, from his time till the 14th c., when the records of the travels of the Venetian Marco Polo opened new fields of inquiry, the statements of Ptolemy were never questioned, and even during the 15th c., it was only among a few German scholars at Nürnberg that the strange accounts given of distant eastern lands by the Venetian traveller were received as trustworthy where he differed from Ptolemy. Marco Polo had, however, unfortunately made no astronomical observations, nor had he even recorded the length of the day at any place, and hence the Nürnberg geographers, who had no certain data for estimating the extent of the countries which he had traversed, were the means of propagating errors which led to results that were destined to influence the history of mankind; for taking Ptolemy's tables as their basis, they had incorporated on their globes and maps the results of their own rough estimates of the length of Marco Polo's days' journeys, and they had thus represented the continent of Asia as extending across the Pacific, and having its eastern shores somewhere in the region of the Antilles. These erroneous calculations misled Christopher Columbus to the false assumption that, by sailing 120° west, he would reach the wealthy trading marts of China, and the result of this conviction was his entering upon that memorable expedition which terminated in the discovery (in 1492) of the continent of America. Although there can be no doubt that the American continent was visited in the 9th and 10th c. by Northmen, the event remained without influence on the history of discovery, and cannot therefore detract from the claims of Columbus. This momentous discovery, which had been preceded in 1486 by the exploration of the African coast as far as the Cape of Good Hope (which was doubled by Vasco da Gama in 1497), was followed by a rapid succession of discoveries; and within 30 years of the date of the first voyage of Columbus, the whole coast of America from Greenland to Cape Horn had been explored, the Pacific Ocean had been navigated, and the world circumnavigated by Magellan (q. v.); the coasts of Eastern Africa, Arabia, Persia, and India had been visited by the Portuguese, and numerous islands in the Indian Ocean discovered. The 16th c. was marked by continued attempts, successful and unsuccessful, to extend the sphere of oceanic discovery; and the desire to reach India by a shorter route than those by the Cape of Good Hope or Cape Horn, led to many attempts to discover a north-west passage, which, though they signally failed in their object, had the effect of very materially enlarging our knowledge of the arctic regions. The expeditions of Willoughby and Frobisher, in 1553 and 1576, of Davis (1585), Hudson (1607), and Baffin (1616), were the most important in their results towards this end. The 17th and 18th centuries gave a new turn to the study of geography, by bringing other sciences to bear upon it, which, in their turn, derived elucidation from the extension of geographical knowledge; and it is to the aid derived from history, astronomy, and the physical and natural sciences, that we owe the completeness which has characterised modern works on geography. In the 17th c., the Dutch, under Tasman and Van Diemen, made the Australasian islands known to the civilised world; and in the latter half of the 18th c., Captain Cook extended the great oceanic explorations by the discovery of New Zealand and many of the Polynesian groups; but he failed to find the antarctic continent, which was first visited in 1840 by American, English, and French expeditions, under their respective commanders, Wilkes, Ross, and Dumont d'Urville. This will probably prove to have been among the last of great oceanic discoveries; and the attention of explorers is now turned to the interior of the great continents. In America, the travels of Humboldt, Lewis and Clark, Fremont, and others, have done much to make us acquainted with broad general features, but much remains to be done in regard to special districts of Central and Southern America. In Asia, numerous travellers, geographers, and naturalists have contributed to render our knowledge precise and certain in respect to a great part of the continent, whose natural characteristics have been more especially represented by the great physicist Ritter; while we owe a large debt of gratitude to the Jesuit missionaries, whose indefatigable zeal has furnished us with a rich mass of information in regard to minor details of Asiatic life and nature. In Africa, the combined influences of a deleterious climate, and a religion hostile to European advance, have hitherto retarded explorations into the interior; but notwithstanding these obstacles, much light has been thrown on the character and condition of the African continent by many of its greatest explorers—as Bruce, Park, Clapperton, Adanson, the Landers, Burton, Speke, Barth, Vogel, and Livingstone. In Australia, although much still remains to be done, the obscurity which had hitherto hung over the interior has been to a great extent diminished by the explorations of Sturt, Eyre, Leichhardt, and the brothers Gregory; and still more by the highly important labours of Burke and Wills, who in 1860 crossed the Australian continent from Melbourne to Carpentaria. Although both these intrepid explorers perished miserably from starvation on their return route, their journals and the description that has been given by them and their sole-surviving companion, King, of the country through which they passed, prove that the land is far from being the desert it was once imagined to be.

The progress which has marked recent discovery has been materially aided by the encouragement and systematic organisation which have been given to plans of exploration by the public governments of different countries, and by the efforts of the numerous geographical societies which have been formed during the present century both at home and abroad; while the constantly increasing mass of information collected by scientific explorers is rapidly diffusing correct information in regard to distant regions, and thus effectually dispelling the numerous fallacies which have hitherto obscured the science of geography. Among the numerous works of authority on the subject of geographical discovery, the following may be consulted with advantage: Hudson's *Geographi Græci minores; Précis de Géographie Universelle*, by Malte Brun; *Manual of Geographical Science* (mathematical, physical, historical, and descriptive), 1860; Latham's *Germania* of Tacitus; Humboldt's *Hist. crit. de l'Hist. de la Géographie, Asie Centrale*, and the *Cosmos;* Ritter's *Asien;* and *Die Erdkunde im Verhältnisse z. Natur. u. d. Gesch. d. Menschheit;* Petermann, *Mittheilungen aus J. Perthes' Geographischer Anstalt* (1855—1857); *Proceedings of Geographical Society*, &c.

GEO'GRAPHY, Medical. The liability of particular localities to become the centres of special diseases, or groups of diseases, has been observed from the most ancient periods, as we have excellent evidence in the Hippocratic treatise, *On Airs, Waters, and Places*, one of the undoubtedly genuine works of the great Greek physician, and one of those which best sustains his traditional reputation. Now-a-days, medical geography has become a most elaborate and carefully investigated branch of medical science, the details of which, though of considerable popular interest, are far too complicated and too technical to be discussed with advantage here. The reader may be referred to the articles ENDEMIC DISEASE, CLIMATE, AGUE, DYSENTERY, GOITRE, LEPROSY, YELLOW FEVER, PLAGUE, REMITTENT FEVER, for incidental illustrations of the subject. Generally speaking, the tropics are subject to diarrhœal diseases, with acute affections of the liver, and severe remittent or pestilential fevers, caused by the exalted temperature acting on the soil, and producing emanations very destructive of health; the like causes in more temperate climates causing ague and diarrhœa, especially during the summer and autumn, in low-lying, ill-drained localities. Temperate climates are also subject in a peculiar degree to pulmonary diseases, and to all manner of contagious fevers, the result of overcrowding and confined air. Certain diseases, again, as goitre, leprosy, and some animal parasites (see ENTOZOA), appear to have no relation to climate, but are found to affect, more or less exclusively, certain well-defined districts of country; as in the case of the Guinea-worm, the Egyptian ophthalmia, the pellagra of Lombardy, the beri-beri of Ceylon and the Malabar coast, and the elephantiasis of the Indian peninsula generally. The best works on medical geography are those of Mühry in Germany, and Boudet in France, which are remarkably learned and complete treatises on the whole subject. A more recent one still is that of Dr August Hirsch of Danzig, a work of immense labour and erudition, not yet completed. On tropical diseases generally, the English works of Annesley, Twining, Morehead, and Sir Ranald Martin are of confirmed reputation.

GEO'LOGY (Gr. *ge* and *logos*), the science of the earth, should include all the sciences that treat of the constitution and distribution of the inorganic matter of the earth, as well as those which describe the living beings that inhabit it; just as astronomy includes the whole science of the heavenly bodies. In this wide sense, as comprising all the physical sciences, it has sometimes been used. As usually employed, however, it has a much more limited meaning, being confined to that section of the sciences which takes cognizance of the hard crust of the earth—of the materials of which it is composed, and of the manner in which these materials are arranged.

The structure of the earth received little attention from the ancients: the extent of its surface known was limited, and the changes upon it were neither so speedy nor violent as to excite special attention. The only opinions deserving to be noticed, that have come down to us, are those of Pythagoras and Strabo. They both observed the phenomena which were then altering the surface of the earth, and proposed theories for explaining the changes that had taken place in geological time. The first held that, in addition to volcanic action, the change in the level of sea and land was owing to the retiring of the sea; while the other maintained that the land changed its level, and not the sea, and that such changes happened more easily to the land below the sea because of its humidity.

From the fall of the Roman empire, during the dark ages, the cultivation of the physical sciences was neglected. In the 10th c., Avicenna, Omar, and other Arabian writers, commented on the works of the Romans, but added little of their own.

Geological phenomena attracted attention in Italy in the 16th c., the absorbing question then being as to the nature of fossils. On the one side, it was held that they were the results of the fermentation of fatty matter, or of terrestrial exhalations, or of the influence of the heavenly bodies, or that they were mere earthy concretions or sports of nature; while only a few maintained that they were the remains of animals. Two centuries elapsed before this opinion was generally adopted. At the outset, it was unfortunately linked to the belief that the fossils were relics of the Noachian deluge.

Steno (1669) observed a succession in the strata, and asserted that there were rocks older than the fossiliferous strata in which no organic remains occur; he also distinguished between marine and fluviatile formations. He was not able, however, to free himself from the absurd hypotheses of his day.

In England, the diluvialists were busy framing idle theories, to give a plausibility to their creed, that the Noachian deluge was the cause of all the past changes on the earth's surface. Differing somewhat in detail, they all agreed in the notion of an interior abyss, whence the waters rushed, breaking up and bursting through the crust of the earth, to cover its surface, and whither, after the deluge, they returned again. Such absurd dreams, obviously opposed to the observed order of nature, greatly hindered the progress of true science.

Leibnitz (1680) proposed the bold theory, that the earth was originally in a molten state from heat, and that the primary rocks were formed by the cooling of the surface, which also produced the primeval ocean, by condensing the surrounding vapours. The sedimentary strata resulted from the subsiding of the waters that had been put in motion from the collapse of the crust on the contracting nucleus. This process was several times repeated, until at last an equilibrium was established.

Hooke (1688) and Ray (1690), differing as much from Burnet as from Leibnitz, advocated views similar to those of Pythagoras. They considered the essential condition of the globe to be one of change, and that the forces now in action would, if allowed sufficient time, produce changes as great as those of geological date. They were followed in the same direction by Vallisneri (1720), Moro (1740), Buffon (1749), Lehman (1756), and Fuchsel (1773), each contributing something additional. Werner (1780) greatly advanced the science by establishing the superposition of certain groups, by giving a system and names, and by shewing the practical applications of geology to mining, agriculture, and medicine. He had very crude notions regarding the origin of the strata, supposing that the various formations were precipitated over the earth in succession from a chaotic fluid; even the igneous rocks he held to be chemical precipitates from the waters. Hutton (1788), rejecting all theories as to the beginning of the world, returned to the opinions of Pythagoras and Ray. He held that the strata which now compose the continents were once beneath the sea, and were formed out of the waste of pre-existing continents by the action of the same forces which are now destroying even the hardest rocks. He introduced the notion of a periodical elevation of the sedimentary deposits from the internal heat raising the bed of the sea. Lyell, in our own day, has adopted and improved these views, eliminating the baseless theories which were mixed up with them, and demonstrating that existing forces might produce all the phenomena of geology.

The determination of the order of the strata, and the grouping of them in chronological order, were begun by Lehman (1756), and carried on by Fuchsel (1773), Pallas (1785), and Werner. Smith made the most important contribution to this subject when, in 1790, he published his *Tabular View of the British Strata.* He shewed their superposition, and characterised the different groups by their peculiar fossils. The publication of his Geological Map of England (1815) may be said to form an epoch in the history of geology. Since then, the science has advanced by rapid strides; and it is not too much to expect that ere long all the chief geological features of the accessible parts of the world will be known and published.

Geology, in its restricted and usual sense, takes cognizance of the solid substance of the earth, or rather of as much of it as is accessible to man's observation. He has not, by his own efforts, penetrated at any point more than a few hundred yards from the surface; but natural sections, and the peculiar arrangement of the stratified rocks (the key to which he has to some extent obtained), have given him an acquaintance with a greater thickness than could have resulted from his own labours. He has thus by actual observations, coupled with reasonings upon them, been able to construct an ideal section representing a depth of perhaps ten miles, or about a 400th part of the distance from the surface to the centre. He does not, and cannot with certainty, know anything of the structure or condition of what is deeper. This does not, however, prevent the attempt to know something of what is beyond; and in making the attempt, there are many facts which serve as bases for inductions, or at least theorisings, as to the condition of the interior of the globe. As the conclusions depend upon the balancing of evidence, upon the value given to one set of facts as set against another, they will differ according to the importance given by each individual to the one or other set of facts.

The long entertained opinion of the existence of a central heat seems to be on the whole fairly established, and upon such facts as these: 1. There is a regular and gradual increase in the temperature of all deep mines, equal to 1° F. for every 55 feet of descent after the first 100. 2. Deep wells have always a high temperature. This has been carefully determined in artesian wells, not only by applying the thermometer to the water at the surface which has risen from a known depth, but also by sinking the instrument to various depths. The results have shewn an increment similar to that exhibited in mines. Hot or boiling natural springs rise through great and deep fissures. 3. Igneous rocks—that is to say rocks which have cooled from a state of fusion by heat—invariably come from below upwards, and thus testify to an amount of internal heat able either to retain these rocks in a state of fusion, or to convert them into a fluid condition before their ejection. 4. Physics also contributes important evidence. The specific gravity of granite or basalt is scarcely 3, while that of the earth, according to the recent experiments of Airy, is about 6½. If the earth were solid, the influence of gravitation would so increase the density of the composing rock as to give a greater specific gravity for the earth than 6½. There must, then, be some expansive force acting to reduce the gravity, and the only force with which we are acquainted that could so act is heat. On the other hand, physics raises difficulties which militate against the fluid condition of any considerable portion of the earth's interior, and in these difficulties it is supported by astronomy. If, however, the observations made in mines and wells supply a measure for estimating the increase from the surface downwards of that heat which seems to be fairly established, then it would follow that the solid crust of the earth is not more than 25 miles thick, for the heat at that depth would be so great as to fuse any known substance.

The strict province of geology is the observed or observable portion of the earth's crust. The early geologists were no more than geognosts—they observed and described the rock-mineralogy of districts, and thus laid the foundations for those generalisations which have raised geology to its present position. The materials of the earth's crust were at first grouped together according to their composition, structure, and origin; but gradually it became evident that the rocks themselves occurred in groups, and that they had a particular order in nature; until at last, all the sedimentary strata were arranged in a single continuous and chronological series, from characters drawn less from their lithological structure than from their organic contents. Both systems of classification are important—that of the geognost as well as that of the modern geologist. The one is the result, to a large extent, of work in the laboratory and the study, and may be accomplished by the examination of hand specimens; the other must be determined in the field, and only from the examination of rocks in the mass, and in their natural position. The term lithology has been applied to the one aspect, while stromatology (*strōma*, a layer) may with equal fitness be given to the other.

Lithology.—All rocks are either igneous or sedimentary; that is, have either been produced by the action of heat, or been arranged by mechanical or other means in layers or beds.

I. The Igneous rocks differ amongst themselves in their composition, structure, and age: they are made up of different materials; they have various textures, as granular, compact, or glassy; and they have been ejected at different periods of the earth's history. From these characteristics, they have been grouped thus: 1. The Volcanic Rocks (q. v.), comprising all that have been formed during the present and tertiary periods, and which are popularly known as lavas and volcanic ash. They have been ejected from volcanoes either in a fluid state, spreading over the land, and cooling as compact lavas; or spreading below shallow water, and becoming vesicular pumice, or as ash scattered in layers over the country; or they have risen into cracks and crevices of rocks as dykes and veins. Their principal constituents are felspar and augite, and the different varieties depend on the predominance of the one or other of these ingredients. The feldspathic lavas are generally light-coloured, and have a rough prickly feel to the finger. The chief varieties are Trachyte, Pearlstone, Phonolite, Obsidian, and Pumice. The augitic lavas are of a dark-green or black colour, weathering brown externally, and are generally heavier than the feldspathic lavas. The most common forms are Dolorite, Basalt, and Leucite. 2. The Trappean Rocks (q. v.), which generally belong to the primary and secondary strata, and are composed of the same materials as the volcanic rocks, except that the silicates of magnesia and lime crystallise in the latter as augite, while they assume the more obtuse form of hornblende in the trappean rocks. Trap-rocks are always associated with a pipe or dyke connecting them with the underlying mass from which the materials were obtained. They have either overflown the surface, and formed a bed conformable to, and contemporaneous with the subjacent strata, or inserted themselves between already formed strata, forming injected sheets that are not contemporaneous. The predominance of the one constituent material over the other gives the basis for grouping the trappean rocks into the feldspathic traps, which are light-coloured and generally compact rocks, the chief varieties being Felstone and Pitchstone, and Hornblendic traps or Greenstones, containing the most abundant and best known rocks of this division. They are of a greenish colour, varying from very light, when the felspar is white and abounding, to almost black, when the constituent minerals are finely divided and coloured with iron. In texture, also, there is considerable difference, some being fine-grained and compact, while in others the crystalline structure is very evident. The principal varieties are Greenstone, Basalt, and Melaphyre. Porphyry occurs in both the volcanic and trappean rocks when the felspar is aggregated in large and evident crystals, scattered through the body of the rock. 3. The Granitic Rocks (q. v.). The striking characteristic of these rocks is the abundance of silex in a separate and uncombined state as pure quartz. Granites are associated with the primary strata; they form also the support of the sedimentary deposit, wherever their base has been exposed to view. They occur in beds overspreading the sedimentary deposits or intercalated with them, in dykes, or as the apparent fundamental and unstratified rock. The chief varieties are true Granite, Syenite, and Protogene.

II. The Sedimentary Rocks occur in layers or strata. They are either aqueous, aërial, chemical, or organic in their origin. 1. The Aqueous Rocks (q. v.) are Argillaceous (q. v.), composed more or less of clay, as kaolin shale and clay-slate; or Arenaceous (q. v.), in which the constituent portions are so large as to be evident to the eye, as in sandstone. The aqueous rocks were deposited in thin layers, which, however, frequently cohere, so as to form solid masses or beds of considerable thickness. Originally deposited horizontally, they have in many cases been subjected to disturbances that have elevated or depressed them; hence have arisen Faults (q. v.) and Dislocations (q. v.), as well as the exposing of the edges of the strata on the surface of the earth (Strike, q. v.) at various angles (Dip, q. v.). 2. The Aërial Rocks, which cannot be easily separated from aqueous rocks, except by their anomalous stratification (see DRIFT). They play so important a part on sandy coasts and arid interiors at the present day, that it cannot be doubted that they helped in former periods to bring the earth into its present condition. 3. The Chemical Rocks have been formed from the evaporation of liquids containing substances in solution. The materials thus deposited are salt, gypsum, lime, and silex. Salt is generally associated with gypsum, and occurs in a great range of formations from the Devonian or Carboniferous, up to the most recent. The salt mines at Northwich, in Cheshire, belong to the Triassic period. Rock-salt occurs in a coarsely crystalline mass, generally coloured with iron, and more or less mixed with clay and other impurities. The deposits are often of great thickness, but apparently of limited extent, and were probably precipitated in isolated brine-lakes. Gypsum seems to have been formed under similar circumstances. It is abundant in the Magnesian Limestone, in the London Clay, and in the Paris Basin. Lime has not been deposited in masses, like gypsum, but only from the exposure to the atmosphere of small quantities of liquid saturated with it, which, by evaporation, have left stalagmitic or tufaceous deposits. Silicious sinter has been deposited in a similar manner as it is at the present day around the hot springs of Iceland. 4. The Organic Rocks are those which have been entirely, or to a large extent, formed from the remains of animals—as chalk and other more compact limestones—or vegetables, as coal, lignite, and diatomaceous deposits.

Changes are continually taking place in the sedimentary rocks, altering their structure and texture. Among the chief agents including these metamorphic changes are chemical attraction, the infiltration of water, the pressure of the superincumbent strata, and above all, heat and magnetism. Some of the older strata have been so much altered that they are generally spoken of as Metamorphic Rocks (q. v.).

Stromatology.—We apply this title to that division of geology which considers the stratified rocks in their chronological order, as exhibiting different phases of the history and development of the globe itself, and in their fossil contents setting forth the progress of life upon its surface. Referring to the article PALÆONTOLOGY for a notice of the animal and vegetable organisms that have been preserved in the rocks, we shall here give a rapid sketch of the various periods in the earth's geological history.

The original, and, as it is supposed, molten condition of the globe is hid in mystery and uncertainty. The geologist takes up the history at the point where air and water make their appearance, and where the inorganic substances were subject to the same influences as those now in operation. It is very doubtful whether the fundamental crust is in any place exposed or has ever been uncovered by man. The earliest rocks observed, though probably not the oldest, are those described by Logan as the *Laurentian System* (q. v.). The typical beds occur in Canada; strata of the same age have lately been detected in Scotland by Murchison and Geikie. The strata have been very much metamorphosed by the action of heat, and by the many chemical and physical forces which heat has set in motion, so that the original condition is entirely altered, the whole series being converted into gneissose strata, with one or two greatly altered beds of limestone. Fossils, if they ever existed, have been obliterated. Even in the succeeding *Cambrian Series* (q. v.), they are very rare, consisting of a few zoophytes, crustaceans, and annelids, with very doubtful impressions of sea-weeds. The rocks of this period consist of thick masses of sandstones and slates or shales. The *Silurian Period* (q. v.) is represented by immense marine deposits, which in some districts are rich in the remains of invertebrate animals, while other extensive tracts have not yielded a single fossil. No certain evidence of plants has yet been observed in this period, yet the economy of life would however require then, as now, oxygen-producers and carbonic acid consumers. Perhaps the anthracite of the graptolitic shales, and the oil from the bituminous Silurian shales of North America, may be in part or in whole of vegetable origin. The first traces of the existence of dry land occur in the *Old Red Sandstone* (q. v.). The great mass of the strata of this period consist of immense thicknesses of limestone, composed of corals and shell-fish, of beds of shale and of sandstone, crowded in some places with fish-remains. A few land-plants and air-breathing animals, the tenants of the dry land, are preserved in the upper strata, which, however, probably belong to the next period. The *Carboniferous Measures* (see CARBONIFEROUS SYSTEM) are ushered in by a great thickness of deep-sea limestone. The coal-bearing strata are alternately sea, estuary, or lake deposits of sandstone, shale, and limestone, and dry land surfaces with the vegetation converted into coal. The waters teemed with fishes of great size and strange form; and the dry land was covered with a rank and luxuriant vegetation of ferns and coniferous trees, and strange forms like gigantic reeds and club-mosses. A few air-breathing reptiles and shells have been found in these strata. The *Permian Period* (q. v.) exhibits a group of organisms differing little from those of the preceding epoch, with the exception of a few added reptiles. The Permian strata are sandstones, gypseous marls, and common and magnesian limestones.

With these beds terminate the Palæozoic Rocks. Before the commencement of the Secondary Epoch, great disturbances and depressions took place in the districts whose geological structure has been examined; and at the same time a great change took place in the character of the animal and vegetable life.

The typical rocks of the *Triassic Period* (q. v.), the earliest of the Secondary Epoch, exist in Germany. They are highly fossiliferous, containing the remains of marine animals of various kinds. In Britain, the rocks are chiefly red sandstones and red marls, the colouring matter of which seems to have been destructive to life; the only fossils they contain are a few land-plants, and some footprints and fragments of bones of reptiles.

The *Lias* (q. v.), which follows, and forms the base of the Oolite formation, consists of extensive clay deposits, with argillaceous limestones and sandstones—strata which indicate the existence of large tracts of land. The contained fossils have a mixed land, fresh-water, and sea character. With considerable numbers of plants and insects, there are also marine brachiopods and cephalopods, and the remarkable swimming reptiles, that are so perfectly preserved as to supply materials for nearly perfect restorations.

The *Oolite Series* (q. v.) consists of alternating beds of limestone and clay, with very little intervening sandstone. The abundance of dry land is testified to by the number and variety of the air-breathing fossils (amongst which mammalia appear for the first time), and even by the occurrence of strata that have been ancient soils. The group is highly fossiliferous.

The *Cretaceous Strata* (see CRETACEOUS GROUP), which, as a whole, have had a deep-sea origin, are introduced by fresh-water and estuary deposits, shewing that great tracts of land were traversed by mighty rivers actively abrading and carrying off materials for delta deposits. The life of the period was abundant. The immense thicknesses of chalk, which give the name to the group, are composed to a very large extent of the perfect or comminuted shells of foraminifera and mollusca. Besides these, land-plants, fresh-water and marine shells and fish, and large terrestrial and marine reptiles, occur. Birds and mammalia have not yet been observed, but it is most probable that they did exist, as they have been found in older strata.

In passing to the Tertiary Epoch, there is not found so striking a change in the life of the globe as that which characterised the division between the Palæozoic and Secondary strata. From the Trias, the fossils have been gradually assuming the appearance of existing organisms: many strange forms have existed and passed away without leaving representatives in the later strata or in the living inhabitants of the earth. Still, the *facies* of the organic remains gradually approaches that of the present fauna and flora, until the *Eocene Period* (q. v.), when some fossils appear, which, if not identical with recent species, so nearly approach them, as to make it impossible to distinguish them. The proportion of such species is from $3\frac{1}{2}$ to 5 per cent. The seas in which the Eocene beds were deposited were comparatively small, and consequently the deposits occur in scattered and isolated basins. The earlier strata are marine, but towards the middle of this period they become lacustrine or fluviatile. The *Miocene Period* (q. v.) is said to contain above 25 per cent. of living forms. It is doubtful whether there are in Britain any true representatives of this period. The strata are largely developed in France and Belgium. Besides abounding in marine mollusca, the Miocene strata contain the remains of many large mammalia. The deposits of the *Pliocene Period* (q. v.) contain from 50 to 70 per cent. of existing forms. The strata are marly sands and gravels abounding with sea-spoils.

In the *Pleistocene Strata* (q. v.), the proportion of existing forms is still greater—indeed, all the principal generic forms now alive, except man, seem to have been in existence during this period. The strata consist of the sands, gravels, and boulder clay left by glaciers and icebergs, of marls and raised sea-beaches.

The newer strata belong to the human period, and have been, and are continuing to be, formed by agents now in operation. They contain the remains of species of plants and animals which still live on the globe.

GE'OMANCY. See DIVINATION.

GEOME'TRICAL, related to Geometry (q. v.), as a geometrical line, demonstration, construction, &c. As to geometrical lines, see CO-ORDINATES, CURVES, and DEMONSTRATION. Geometrical constructions and solutions were anciently such as were effected by means of the straight line and circle—the only lines which were regarded as properly geometrical—and according to the strict rules of geometry. The ancient geometers employed two methods of reasoning in their inquiries and demonstrations, known as *geometrical analysis* and *synthesis*. Of these, the synthetical method was the older and more generally employed. It is abundantly illustrated in Euclid's *Elements*, in which new truths are deduced from combinations of truths already established, so that every proposition depends on others preceding it. See SYNTHESIS. Though admirably suited for the demonstration of truth once ascertained, this method was found of little use in the discovery of truth, or of the mode of its demonstration. For these purposes, the analytical method is admirably adapted. See ANALYSIS. According to this method, the proposition which is to be proved is assumed to be true, or the construction required is supposed to be effected; and then the conditions of the proposition being true, or the construction effected, are investigated by reasoning backwards till some elementary truth or simple construction is reached, on which the truth or construction under inquiry is seen to depend. The analytical method of reasoning in geometry is said to have been invented by Plato. The Greeks have left on record many proofs of the power and beauty of the method as a means of discovery.

GEOMETRICAL MEAN of two numbers is that number the square of which is equal to the product of the two numbers; thus, the geometrical mean of 9 and 16 is 12, for $9 \times 16 = 144 = 12^2$; hence the geometrical mean of two numbers is found by multiplying the two numbers together, and extracting the square root of the product.

GEOMETRICAL PROGRESSION. A series of quantities are said to be in geometrical progression when each term of the series is equal to that which precedes it multiplied by some constant factor—i. e., some factor which is the same for all the terms; or, in other words, when the ratio of any two successive terms is the same. Thus $a, ar, ar^2, ar^3 \ldots$ and 2, 6, 18, 54... are geometrical series. The sum of n terms of the former series may be easily obtained. Let it be S. Then $S = a + ar + ar^2 + \ldots + ar^{n-1}$. Multiply both sides by r, we have $rS = ar + ar^2 + \ldots + ar^n$. Subtracting the former of these expressions from the latter, we have $(r - 1)S = ar^n - a$. Whence we have $S = a . \frac{r^n - 1}{r - 1}$. If the series be one whose terms constantly diminish, i. e., if $r \angle 1$, and then if we suppose n indefinitely great, r^n will be indefinitely small, and we shall have $S = \frac{a}{1 - r}$ for the sum of the series extended *ad infinitum*. For example, the sum of the series $\frac{3}{10} + \frac{3}{10^2} + \frac{3}{10^3} + \ldots$ *ad infinitum* is $\frac{1}{3}$. It is obvious that any three of the four quantities a, r, n, S being given, the equation $S = a . \frac{r^n - 1}{r - 1}$ will enable us to find the fourth.

GEOMETRICAL TRACERY, a name frequently used to distinguish a class of tracery where the parts are all more or less like diagrams in geometry. See Tracery.

GEO'METRY, the science of space, discusses and investigates the properties of definite portions of space under the fourfold division of lines, angles, surfaces, and volumes, without regard to any physical properties which they may have. It has various divisions, e. g., Plane and Solid Geometry, Analytical or Algebraical Geometry, Descriptive Geometry, and the Higher Geometry. Plane and solid geometry are occupied with the consideration of right lines and plane surfaces, and with the solids generated by them, as well as with the properties of the circle, and, it may be said, the sphere; while the higher geometry considers the conic sections and curved lines generally, and the bodies generated by them. In the higher geometry, immense advances have recently been made through improved methods, the application of modern analysis, and the various calculi in algebraical geometry, the nature of which is explained in the article Co-ordinates (q. v.). Descriptive geometry, a division of the science so named by Monge (q. v.), is properly an extension or general application of the principle of Projections (q. v.), its object being to represent on two plane surfaces the elements and character of any solid figure. It has many practical applications. When one surface penetrates another, for instance, there often result from their intersection curves of double curvature, the description of which is necessary in some of the arts, as in groined vault-work, and in cutting arch-stones, &c., and this is supplied by descriptive geometry.

The history of geometry is full of interest, but no more can be given here than a very bare sketch of it. The name of the science (Gr. and Lat. *geometria*) originally signified the art of measuring land. Herodotus, the earliest authority on the subject, assigns the origin of the art to the necessity of measuring lands in Egypt for the purposes of taxation, in the reign of Sesostris, about 1416—1357 B.C. (Hero, book ii. chap. 109). This is probable, not only as resting on such authority, but also because, *à priori*, we should expect the necessity of measuring lands to arise with property in land, and to give birth to the art. Of the state of the science, however, among the Chaldeans and Egyptians, we have no record.

The story of Herodotus is further confirmed by tradition. Proclus, in his commentary on Euclid's *Elements* (b. ii. c. 4), says that the art was brought to Greece from Egypt by Thales, who was himself a great discoverer in geometry. The Greeks at once took keenly to the study; various disciples of Thales excelled in it, chief among them Pythagoras, who, according to Proclus, first gave geometry the form of a deductive science, besides discovering some of its most important elementary propositions, among others, it is said, the 47th Prop. Euc. b. i. See article Pythagoras for a notice of his other contributions to the science. Pythagoras had illustrious successors: Anaxagoras of Clazomenæ; Ænopidis, the reputed discoverer of Euc. b. I. 12, 23; Briso and Antipho; Hippocrates of Chios, who 'doubled the cube,' and quadrated the lunula, which bear his name, and is said to have written a treatise on geometry; Zenodorus; Democritus of Abdera; and Theodorus of Cyrene, who is said to have been one of the instructors of Plato, whose name marks an epoch in the history of the science. Over his Academy at Athens, Plato placed the celebrated inscription, *Medeis ageometretos eisito* ('Let no one ignorant of geometry enter here'), thus recognising it as the first of the sciences, and as the proper introduction to the higher philosophy. He is the reputed inventor of the method of geometrical analysis, and of geometrical loci and the conic sections, called in his time the higher geometry. From his Academy proceeded many who advanced the science, of whom Proclus mentions thirteen, and more than one of them as having written treatises on the subject, that have been lost. We shall mention but two of these: Eudoxus, who is said to have brought into form and order in a treatise the results of the studies at the Academy, and to have invented the doctrine of proportion, as treated in the 5th book of Euclid's *Elements;* and the great Aristotle, who assigned geometry as high a place as Plato did, and who wrote a treatise on the subject, as did at least two of his pupils, Theophrastus and Eudemus, from the latter of whom Proclus took most of his facts. Autolycus, a disciple of this Theophrastus, wrote a treatise on the movable sphere, yet extant; while Aristæus, the reputed instructor of Euclid in geometry, is said to have written five books on the conic sections, and five on solid loci, all of which are lost.

The name of Euclid marks another epoch in the history of geometry, and the chief interest of the vague sketch above given of the labours of his predecessors lies in its demonstrating the great mass of materials from which he constructed his *Elements*—the variety of treatises which prepared the way for that great work whose pre-eminence has now for over 2000 years been undisputed. In the *Elements*, Euclid collected all the theorems which had been invented by his predecessors in Egypt and Greece, and digested them into fifteen books, demonstrating and arranging the whole in a very accurate and perfect manner. See Euclid. Next to Euclid, of the ancient writers whose works are extant, must be named Apollonius Pergæus, who flourished about 230 B.C., and about 100 years later than Euclid, and was called 'the Great Geometrician,' on account of his work on the Conics, and other ingenious geometrical writings. Much about the same time with Apollonius flourished Archimedes, not less celebrated for his geometrical than for his mechanical inventions. See Archimedes, and Apollonius of Perga. It may be mentioned that Apollonius first gave the names of *ellipse* and *hyperbola* to two of the conic sections, the third of which had previously been called the *parabola* by Archimedes.

For a long period after the time of Archimedes, we find few names of note in connection with geometry. We but mention Nicomedes, Hipparchus, and Theodosius of Tripoli. The Greeks, however, never intermitted their attention to the science; they continued it even after their subjugation by the Romans, and we find them producing many excellent geometers after the translation of the Roman Empire, and within our era: Ptolemy (q. v.), who died 147 A.D.; Pappus (q. v.), who lived in the time of Theodosius (379—395 A.D.); Proclus, who lived in the 5th, and Eutocius, in the 6th century. The works of all these writers are still extant. Meantime, the Romans, the dominant race, even in the most flourishing time of the republic, were so ignorant of the science, that, according to Tacitus, they gave the name of Mathematicians (q. v.) to those who practised divination and judicial astrology. As may be supposed, their domination was not favourable to the science, and only one Roman name can be mentioned—viz., Boëthius, who lived towards the close of the 5th c., who attained eminence in geometry; and of his writings, it must be said, as of the Roman literature generally, that they were but compilations and reflections of Greek thought. But if the Roman empire was unfavourable, its downfall, and the consequent inundation of ignorance and barbarism, were still more so. The rise of the Mohammedan power in the 7th c., and the rapid and desolating consequences which followed, further hastened the extinction of the Greek sciences. The time now came when those who devoted themselves to science were everywhere branded as magicians, and exposed to popular fury. It was in these times that, fortunately for civilisation, an asylum was found for the spirit of inquiry in Arabia. An acquaintance with the science of the Hindus prepared the Arabians for the reception of the writings of the Greek astronomers and mathematicians; and the dispersion of the scientific coteries of Alexandria gave to Bagdad many preceptors in the learning of the West. In little more than a century after it took place, the Arabians were the most zealous patrons and cultivators of Greek science; from the 9th to the 14th centuries, they produced many astronomers, geometricians, &c.; and through them the mathematical sciences were again restored to Europe towards the close of the 14th c., being first received in Spain and Italy. The revival of ancient literature in Europe, and the discovery of the art of printing about the middle of the 15th c., concurred to diffuse a knowledge of the science of the Greeks, which came into notice with their general literature; and from this date, many names occur of eminent geometricians. During the 16th c., Euclid was held in such estimation, that no attempts were made to advance the science beyond the point at which he left it. Commentaries and translations of the *Elements* of Euclid were rife; but till the time of Kepler, no attempts were made to improve or extend the methods of geometry. Kepler (q. v.) introduced the principle of infinity into geometry. Next, Descartes, seizing the results of Vieta's discoveries in the use of symbols, invented the new or the analytical algebraical geometry, which vastly extended the domains of the science. It then required but the invention of the calculus to give the science that grand sweep and power which it now possesses. For a notice of some of the more recent improvements in geometrical methods, see TRANSVERSALS, POLARS, PROJECTIONS. The reader will also find a very excellent view of the growth of the science in the introduction to Mr Pott's *Euclid* (London, 1845); also under the various names of those mentioned in this article, will be found fuller notices of their contributions to the science. No full list can be given of the contributors, but it would be unjust not to refer here to Johann Müller (called Regiomontanus), Copernicus, Tartaglia, Vieta, Galileo, Fermat, Roberval, Pascal, Huyghens, Barrow, Newton, the Gregories, Lagrange, Clairaut, Euler, Robert Simson—whose translation of Euclid may be regarded as the standard text in English—Mathew Stewart, Brook Taylor, Maclaurin, Monge, Poncelet, Carnot, Chasles, and Sir William Hamilton of Dublin. See also QUATERNIONS.

GEORGE I., king of Great Britain, son of Ernst August, Elector of Hanover, and of Sophia, a granddaughter of James I. of England, was born on 28th May 1660. According to the theory that the blood of James II. in the direct line was 'corrupted,' he was the nearest heir to the crown. On the death of Queen Anne, 31st July 1714, he was instantly proclaimed king, and arrived in this country from his electorate of Hanover at the age of 54. To him this country was to the last a foreign country, for which he had no love, and of the language, feelings, and thought of which, he was profoundly ignorant. His affections remained with Hanover, but to Britain his alliances, experience, and fair abilities for business, resolutely exercised, were of considerable value. A king of more brilliant parts might have been an impediment in the way of constitutional government adjusting itself to habits of domestic peace and order after the dethronement of the Stuarts, whose ruined fortunes excited the pity of the people, and afforded a convenient cry for the minority, that declaimed in private, and wrote songs, and plotted against the imported king, whom they called a 'foreign tyrant.' Being supported by the Whigs, and undisguisedly partial to them, the Tories were adverse to him, as well as the Jacobites, and they associated together to bring about a revolution. In Scotland, in 1715, the Earl of Mar raised the standard of rebellion; and he had collected about 10,000 men, when he engaged the Duke of Argyle with about half that number of men at Sheriffmuir, near Dunblane. It was a drawn battle, the left wing of both armies being victorious; but to the rebels it was not a victory, and it caused delay and checked their progress, and that was equivalent to a defeat, for the Highlanders, seeing little prospect of fighting and plunder, returned home; and in that part of the island the rebellion may be said to have burned out of itself. In England, it did not succeed so well; and it was ended miserably by the unconditional surrender of the insurgents at Preston. For this outbreak the Earl of Derwentwater and Viscount Kenmure were beheaded on Tower Hill, several officers were shot, many persons of distinction were attainted, about thirty of the less conspicuous rebels were executed, and above 1000 were transported to the plantations. The Earl of Mar and the Pretender both escaped to France.

The next most notable and calamitous event of this reign was the failure of the South Sea Company (q. v.). A quarrel with the Spaniards commenced in 1726, which issued in a somewhat unsuccessful expedition of Admiral Hosier to their American possessions, and a fruitless attempt on Gibraltar (q. v.) by the Spaniards. In 1727, George I., who had, amid the splendours of British royalty, sighed for his fatherland and his family, set out for Hanover, and died of apoplexy on his way to visit his brother, who was Bishop of Osnaburg, on the night of the 10th or the morning of the 11th of June. His life was not a happy one. His wife, Sophia Dorothea of Zell, to whom he was untrue, had solaced herself by yielding to the attentions of Philip von Koningsmark. On Sunday the 1st July 1694 the latter disappeared for ever in a mysterious way, and on the 28th December Sophia was divorced. The remaining 32 years of her life were spent as a prisoner in the fortress of Ahlden, where she died at the age of 60. There are clear glimpses of George I. in Carlyle's *Life of Frederick the Great.* Carlyle commends his talent for silence, and thinks him, in spite of appearances, a man of more human faculty, 'chiefly of an inarticulate kind,' than he generally gets credit for.

GEORGE II. succeeded his father as king of England in the 45th year of his age. He was born at Hanover on the 30th October 1683, and married Carolina Wilhelmina, daughter of the markgraf of Anspach. She is said to have been a woman of uncommon attainments in literature, theology, and politics, and her death in 1737 was reckoned a public loss. The king himself did not aspire to a code of morals different from his fathers, nor to any intellectual accomplishments except those of a soldier. He was present at the battle of Dettingen in 1743, and with the assistance of the Earl of Stair he gained it: the French being entirely defeated, and very efficient service rendered to Maria Theresa of Hungary, who had besought it to prevent the partition of her dominions. His second son, the Duke of Cumberland, was not so fortunate, for the English forces under him were defeated with great loss in 1745 at Fontenoy by the French under the famous Marshal Saxe. In the same year (1745) Prince Charles Stuart, son of the old Pretender, landed in Scotland with seven officers, and arms for 2000 men. After some transient successes, he was completely defeated at Culloden, 16th April 1746, and what is known as the *Second Rebellion* was brought to an end. (See STUART, CHARLES EDWARD.) The Duke of Cumberland, whose barbarities in the suppression of the insurrection earned him the name of the 'Bloody Butcher,' returned to the command of the English forces on the continent, and was repeatedly beaten by Marshal Saxe and the French; much that Marlborough had gained being lost. In India, Colonel, afterwards Lord Clive, gained various victories, the chief of them being the victory at Plassey in 1756, which laid the foundations of the British East Indian Empire; and during the next three years the British dominion in North America was extended and strengthened by the victory of Wolfe on the heights of Abraham, and by the subsequent surrender of Quebec. British allied troops contributed to the Hanoverian victory at Minden in 1739. G. died 25th October 1760, in the 77th year of his age, and the 34th of his reign. Generally, the reign of George II. was a prosperous one: according to Hallam, 'the most prosperous period that England had ever known;' and it was this not less from the acquisition of new territory, than from the conquest of new fields of thought effected by Pope, Hume, Samuel Johnson, Fielding, Smollett, Reynolds, Hogarth, and many others.

GEORGE III., son of Frederick Lewis, Prince of Wales, succeeded his grandfather, George II. He was born on the 4th June 1738, and died at Windsor Castle, on the 29th January 1820, in the 60th year of his reign, which was eventful as well as long. On 8th September 1761, he married the Princess Charlotte Sophia, daughter of Charles Duke of Mecklenburg-Strelitz, and was by her the father of fifteen children. His intellect was not of the strongest, but, like his two predecessors, he had firmness of purpose, and, in addition, a conscientiousness and sense of decorum unknown to them, while both friends and enemies could rely upon him—the one for favours, and the other for the reverse. His mind gave way several times —in 1764, in 1788, in 1801, in 1804; and in 1810, when the British were fighting behind the lines of Torres Vedras, his final insanity supervened. He had an abundance of cares, like most sovereigns. The *Letters of Junius* and the invectives of Wilkes annoyed him; so did the proposals to emancipate the Roman Catholics and the terrible French Revolution of 1789. His life was attempted by the maniacs Margaret Nicolson and a man named Hatfield. The marriages of two of his brothers with the widows of subjects displeased him, and led to the passing of the Royal Marriage Bill, 12 Geo. III. c. 11, prohibiting the members of the royal family from contracting marriage without the consent of the king, if under twenty-five years of age, and the consent of parliament if above that age; and afterwards the undoubted debts and dissipation of his eldest son, who became George IV., his hardly doubtful marriage with Mrs Fitzherbert, the Roman Catholic widow of two husbands, and the scandals of his public marriage with his cousin, Caroline of Brunswick, must have led the 'good old king' to reflect that not even a 'marriage-bill' could cure all the domestic miseries of monarchs. Nor were matters of national excitement and magnitude awanting. A bill, imposing certain stamp-duties upon the American colonies, which had been resolved to be inexpedient in 1764, was passed in March 1765, and repealed in 1766 by the Marquis of Rockingham's ministry; and in 1767 the chancellor of the exchequer, Mr Townshend, brought forward a plan for the taxation of these colonies, which led to their revolt, the colonists objecting to be taxed by a parliament in which they were not represented. In 1770, Lord North, the premier, brought in a bill for the repeal of all the recently imposed American duties, except the duty on tea, which was retained, to assert the English right to impose taxes on these colonies. In December 1773, 'Boston harbour is black with unexpected tea,' cargoes of it being wantonly destroyed by the colonists; and on 19th April 1775, hostilities commenced with the undecisive battle of Lexington, which on the 16th June was followed by that of Bunker's Hill, which was a victory to the colonists, and helped to give them boldness to renounce the dominion of Great Britain, and publish the declaration of independence on the 4th July 1776. George Washington, a colonel of militia, who had been appointed general of the insurgent colonists, took possession of Boston in that year, having compelled General Howe and the British troops to retire, and next year he gained an important advantage by the capture of Burgoyne's army of 10,000 fine troops, British and German. The French, Spanish, and Dutch all threw their weight into the American scale, and the chequered and disastrous struggle ended in America by the surrender of Lord Cornwallis, with a British army of 6000, to Washington and the Marquis de la Fayette. The French suffered at sea by the gallantry of the British under Byron, Hood, and Rodney, this last having, in 1782, in the West Indies, obtained over them a naval victory by the hitherto untried method of breaking the enemy's line. In that year, also, General Elliott repulsed the grand attack of the French and Spaniards, and put an end to their chances of success in the obdurate siege of Gibraltar. At Versailles, on 3d September 1783, a peace was concluded with France and Spain, in which the independence of the American states was recognised, not a little to the satisfaction of many of the English at home, who, besides being tired of the struggle, had throughout the contest sympathised with the American colonists, whose cause, originally good, had had its merits kept before the public mind by the eloquence of Chatham, Fox, and Burke, three of the greatest orators of all time.

Meanwhile, the British rule in India was consolidated, and this was effected in no insignificant degree under the governor-generalship of Warren Hastings, a most able but somewhat unscrupulous man. His trial for misrule and oppression, famous for the eloquent accusations of Burke and Sheridan, began in 1786, and was protracted for nine years. Wars with Hyder Ali and his son Tippoo Saib were ended by the storming of Seringapatam in 1799.

The after-swell of the French revolution broke over all the continent of Europe in wave after wave of war. The aversion of Britain to the insane democracy of France was not concealed, and in 1793, a few days after the execution of their king, the French declared war against Britain. In the confused warfare that followed, the English, under Lord Howe, in 1794, defeated the French fleet in the Channel; under Sir John Jervis they defeated the Spanish fleet off Cape St Vincent in 1797; and also in that year, under Lord Duncan, they defeated the Dutch off Camperdown; and in 1798 Nelson was victorious on the Nile over the French fleet that had conveyed Napoleon Bonaparte and his troops to Egypt. In 1801, he bombarded Copenhagen, and partially destroyed the Danish fleet; and the forces under Sir Ralph Abercromby—who was mortally wounded—gained the victory of Alexandria over the troops which Napoleon had left in Egypt to menace the power of Britain in the East. On 25th March 1802, the treaty of peace of Amiens was signed, but, within a year, hostilities were renewed. In 1803, Hanover was occupied by the French. On October 21, 1805, Nelson lost his life, and gained his greatest victory of Trafalgar over the French and Spanish fleets. Napoleon's splendid victory of Austerlitz over the Austrians and Russians, December 1805, was survived only a few weeks by the great statesman Pitt, whose breaking heart and constitution could not sustain the shock of this last disappointment. Napoleon's Berlin decree of 1806, and his Milan decree of 1807, declaring the British dominions in a state of blockade on purpose to destroy British commerce, were not supported by a sufficient navy to carry them into execution by capturing vessels trading with Britain; but they did no inconsiderable damage. In 1808, Sir Arthur Wellesley landed in Portugal, and defeated the French at Vimeira; but the advantage of this victory was thrown away in the Convention of Cintra. The retreat, four months after, to Corunna of the English army under Sir John Moore, from overwhelming odds, and its safe embarkation in January 1809, after the repulse of Marshal Soult, has secured a reputation for the able and distinguished general who fell there hardly inferior to that of those who have died in the moment of victory. In April of that year, Sir Arthur Wellesley returned to the command in the Peninsula, and after conquering at Talavera on the 8th of July, wearing out the powers of the assailing French behind the lines of Torres Vedras during the last months of 1810, and conquering at Fuentes de Onoro in 1811, at Salamanca in 1812, at Vittoria in 1813 (as Lord Wellington), and in other battles and sieges, he drove the French out of the peninsula. The struggle was terminated on the eventful field of Waterloo (q. v.), 18th June 1815.

On the 1st of January 1801, Ireland was united to Great Britain, and its separate legislation was abolished. During this reign many Scotchmen had forced their way to the first places in the state; all the Jacobite feelings had died out; and the Union had become not a legislative one merely, but a union of society, literature, thought, and enterprise. The most original and vigorous thought of this period found its expression in poetry, and among its great poets, the most noteworthy are Byron, Coleridge, Wordsworth, and Walter Scott, the last of whom is also at the head of all the writers of prose-fiction. In spite of the depressing effects of war, commerce greatly increased during the 60 years of this reign; and the revenue, which at the beginning of it was under nine millions, had, during the years of the French war, been increased more than sevenfold, thus shewing, though by an undesirable method, the vast increase of the resources of the country. Chemistry and the steam-engine were beginning to alter the face of society. Among legislative reforms, the most conspicuous was the abolition of the punishment of death for minor crimes, and generally the statute-book, which had greatly increased, became more and more favourable to individual liberty.

GEORGE IV. became king of Great Britain on his father's death. He had been virtual sovereign during the long period of his father's last insanity, as Prince Regent. He was born on 12th August 1762, and died on the 26th June 1830. That he should have lived so long as 67 years is not the least notable circumstance connected with a life that has supplied as much material for scandal as any in English history. G. had considerable intellectual ability and address, could tell stories well, and enjoy every day without thinking of the next. His personal attractions, and his position together, led many in his lifetime to style him, not without sincerity, 'the first gentleman of Europe;' but the decay of king-worship, and the growth of morality, have not allowed that to continue to be the opinion of his countrymen. His frailties, and those of his royal namesakes, have been mercilessly exposed by Thackeray in his 'Four Georges' (1861). Unfortunately for their memory, no man of Thackeray's abilities has set himself to look for their virtues and their good deeds to England —which were not few—and for which they have earned the gratitude of patriots, not mere blind worshippers of royalty.

The marriage of George IV. was specially unfortunate. He entered into it on 8th April 1794, with his cousin, Caroline Amelia Elizabeth, second daughter of the Duke of Brunswick, under the pressure of debt, and of his father, and their conjugal happiness, if it ever existed, did not last many weeks. The Princess Charlotte Augusta was born of the marriage on 7th January 1796, and shortly after her parents separated, having ceased to speak to each other months before. See CAROLINE. The Princess Charlotte had married Prince Leopold, now (1862) king of Belgium, and she died in childbed on 6th November 1817, greatly to the grief of the whole nation.

Royal visits to Scotland and Ireland; the aid rendered to the Greeks by the British fleet in the battle of Navarino (1827), which secured the independence of Greece; and the passing (1829) of the Roman Catholic Relief Bill (q. v.) (so odious to his father), are the most notable incidents of this king's reign. He was succeeded by his brother William, Duke of Clarence, who had entered the navy in his youth.

GEORGE (the Bearded), Duke of Saxony, eldest son of Albert (the Brave), the founder of the Ducal or Albertinian Saxon line, was born in 1471. He early exhibited a strong desire for the acquisition of religious knowledge, and in 1484 was sent to Meissen to pursue his studies, with a view to his entering the church. On the death of his father in 1500, G. succeeded to the whole dukedom, consisting of the half of Thuringia and Meissen, with the exception of the lately acquired country of Friesland, which fell to his younger brother Henry; who, however, soon after exchanged it with G. for Freiberg and Wolkenstein. Though G. and William, Duke of

Lower Bavaria, were the two pillars of Catholicism in Germany, yet the former did not appear to be much displeased with the proceedings of Luther previous to the Leipsic controversy; on the contrary, they were at one in regard to the many abuses which had crept into the church, but G. wished to remedy them through papal edicts, or the decisions of a general council. The ill-feeling between G. and Luther commenced during the Leipsic controversy, and arose from a misapprehension of Luther's doctrine of justification by faith; it necessarily increased in strength in one who was so remarkable for obstinacy, especially as it was carefully fostered by John Eck and other of Luther's enemies. Yet when the emperor seemed likely to violate his safe conduct given to Luther, G. strongly protested against such a breach of good faith. The later years of his reign were imbittered by a succession of domestic calamities: first his wife died, then all his children in succession, and thus his brother, Henry of Freiberg, became heir-apparent. Henry was a zealous Protestant, and such was G.'s antipathy to being succeeded by one of that religion, that he attempted to break the line of succession, but did not live long enough to accomplish his purpose. He died in 1530, and was succeeded by Henry.

GEORGE, a district of the Cape Colony, is separated from that of Zwellendam on the west by the Gauritz (q. v.). It contains 4032 square miles, and about 20,000 inhabitants. It is valuable chiefly for its pasturage and its timber. On its coast is the port of Mossel Bay.

GEORGE (Lake), called also Horicon, a picturesque sheet of water, remarkable for its transparency and for the beauty of the scenery on its shores, lies in the state of New York, and measures 34 miles by 3. It discharges its waters into Lake Champlain, thus forming a part of the grand system of the St Lawrence. It is, in some places, 400 feet deep. It possesses some historical interest in connection with the North American wars between England and France.

GEORGE (St), one of the Bermudas, is strongly fortified, and forms the principal depôt in the group for military purposes. On the south coast is a town of its own name, which has a large harbour of considerable strength.

GEORGE, St, a saint, venerated both in the Eastern and Western churches, held in especial veneration as the patron of Chivalry, and adopted as the tutelary saint of England. His origin is extremely obscure; and the very oldest accounts of him which are extant contain a strange admixture of history and legend. He is honoured both in the East and the West as a martyr, and the Greek acts of his martyrdom fix the date of his death as the persecution under Diocletian; but these acts are, by the confession even of Roman Catholic hagiologists, undoubtedly spurious. On the other hand, it is asserted (see Gibbon's *Decline and Fall*, ii. 323) that the canonisation of G. is one of the many errors which Protestant historians freely impute to the Roman calendar, and that the George who is thus reputed a saint and martyr is no other than the turbulent and unscrupulous Arian partisan, George of Cappadocia, whom his Arian followers revered as a saint, and imposed as such upon the credulity of their Catholic countrymen. It must be confessed, however, that the best modern authorities, Catholic and Protestant, agree in admitting the great improbability of this allegation. Heylin is of one mind in this matter with the Jesuit Papebroch, and Dean Milman adopts the arguments, and agrees in the opinion of the Roman Catholic Bishop Milner. The truth is, that whatever is to be said of the early accounts of the martyrdom of G., the fact of his being honoured as a martyr by the Catholic church, of churches being dedicated to him, and of the Hellespont being called 'St George's Arm,' is traced by Papebroch, by Milner, and by other writers to so early a date, and brought so immediately into contact with the times of the angry conflicts in which George of Cappadocia figured as an Arian leader, that it would be just as reasonable to believe that the Catholics of England at the present day would accept Lord George Gordon as a Catholic saint, as to suppose that the Catholics of the East—while the tomb of Athanasius was hardly closed upon his honoured relics—would accept as a sainted martyr his cruel and unscrupulous persecutor. Indeed it cannot be doubted that the St G. of the Eastern Church is a real personage, and of an earlier date than George of Cappadocia—very probably of the date to which these acts, though otherwise false, assign him. The legend of his conflict with the Dragon arose most probably out of a symbolical or allegorical representation of his contest with the pagan persecutor. As in this ancient legend St G. appears as a soldier, he was early regarded as one of the patrons of the military profession. Under this title, he was honoured in France as early as the 6th c.; but it was not until after the Crusaders, who ascribed their success at the siege of Antioch to his intercession, returned to Europe from the Holy War, that the religious honour paid to him reached its full development. He was selected as the patron saint of the Republic of Genoa and also of England. At the council of Oxford, in 1222, his feast was ordered to be kept as a national festival. In 1330, he was made the patron of the Order of the Garter by Edward III.; and even since the Reformation, the ancient sentiment is still popularly maintained.

GEORGE, St, Banner of, white with a red cross. According to Sir N. H. Nicolas, the cross of St George was worn as a badge over the armour by every English soldier 'in the 14th and subsequent centuries, even if the custom did not prevail at a much earlier period,' to indicate that he was in the service of the crown. On the invasion of Scotland by Richard II. in 1386, it was ordained 'That everi man of what estate, condicion, or nation they be of, so that he be of oure partie, bere a signe of the armes of Saint George, large, bothe before and behynde, upón parell that yf he be slayne or wounded to deth, he that hath so doon to hym shall not be putte to deth for defaulte of the crosse that he lacketh. And that non enemy do bere the same token or crosse of St George, notwithstandyng if he be prisoner, upon payne of deth.' A similar ordinance was adopted by Henry V. for the government of his army in France.

GEORGE, The, the badge of the Order of the Garter (q. v.), exhibiting the figure of St George on horseback piercing the falling dragon, which lies on a mount.

GEORGE'S CHANNEL, St, is the name applied to the south portion of that arm of the Atlantic which separates Ireland from the United Kingdom. A line, extending from Holyhead in Wales to Dublin, would form the northern limit of this channel; and a similar line from St David's Head to Wexford, would form its southern limit. At its northern extremity it is 64 miles in width, and at its southern it is about 62 miles wide; its length, from north-east to south-west, is about 100 miles.

GEORGETOWN, a city and port of entry of North America, in the state of Maryland, is situated on a range of hills, the highest of which are denominated the *Heights*, on the left bank of the Potomac, two miles north-west of Washington (q. v.). From the Heights, which are occupied by elegant villas, a magnificent view of the cities of G., Washington, and of the surrounding country is obtained. G. is quiet and antiquated, and has a reputation for its literary advantages and for its refined society. Its principal institutions are the Georgetown College, under the management of the Jesuits, and the convent of Visitation Nuns—attached to which is an academy for females with about 100 pupils. Here the Alexandria branch of the Chesapeake and Ohio Canal is carried across the Potomac by means of an enormous viaduct 1446 feet long, and 36 feet above the ordinary level of the water. As it is the only port in the district of Columbia, and situated at the head of the navigation of the Potomac, 125 miles from its mouth, its foreign commerce and coasting trade are important. It keeps 50 mills in operation to supply its trade in flour. It is one of the greatest markets in the United States for shad and herrings, of which vast quantities are caught in the Potomac, and brought here for barrelling. Pop. 1850, 8336; 1854, 10,000.

GEORGETOWN (Dutch, *Stabroek*), the capital of British Guiana, is situated at the mouth, and on the right or eastern shore, of the river Demerara, in lat. 6° 49′ 20″ N., and long. 58° 11′ 30″ W. It is handsomely built, and consists of spacious, clean streets, intersecting at right angles, and composed of neat wooden houses, which are raised three or four feet above the ground, in order to avoid the damp, have open verandahs in front, and are embosomed in trees, of which the cabbage-palm, the cocoa-nut, and the orange tree are the chief. Most of the streets are traversed by canals, communicating with each other and with the river. Of the public buildings, the town-hall, an elegant structure, with marble-paved galleries resting on cast-iron columns, the Episcopal cathedral, and the Colonial Hospital, are the principal. There are also a mariners' hospital, numerous churches and schools, astronomical and botanical societies, barracks, theatres, and a market-place surrounded by elegant and well-stocked shops. G., owing to the low and swampy character of the district in which it stands, is unhealthy. Yellow and intermittent fevers, diarrhœa, dysentery, and dropsy are local diseases. The chief exports of G. are sugar, coffee, and rum; and in 1853 its trade employed 591 vessels of 101,764 tons. Pop. 1851, 25,508, of which about 20,000 were negroes and people of colour.

GEO'RGIA, GULF OF, an arm of the North Pacific Ocean, between Vancouver's Island and the mainland of British Columbia. It averages 20 miles in width, is 100 miles in length, receives Fraser River (q. v.), and communicates with the open ocean by Queen Charlotte's Sound in the north, and by the Strait of Fuca in the south. Its southerly entrance is about lat. 49° N. and long. 124° W.

GEORGIA, an Atlantic state of the American Union, and one of the 13 original states, extends in lat. from 30° 21′ to 35° N., and in long. from 80° 48′ to 85° 40′ W. It is bounded on the N. and N.E. by the states of Tennessee, North Carolina, and South Carolina, on the W. by Alabama, and on the S. by Florida. Its extreme length, from north to south, is 320 miles; and its greatest breadth, from east to west, is 254 miles. Its area is 58,000 square miles; and its population in 1860 was 1,082,797. The population in 1859 was 1,014,418, of which the whites numbered 571,534; the slaves, 439,592; and the free-coloured, 3292. In 1859, the state of G. had a representative population of 778,054, and was entitled to 8 members in the national house of representatives, and to 10 electoral votes for president of the United States. G. presents every variety of surface, rising from low alluvial lands and swamps along the shore through an undulating and rough hilly country to the Blue Ridge Mountains, in the north and north-west of the state. The chief rivers are the Savannah, which forms the north-east boundary of the state, and the Chattahoochee, which forms a great portion of its south-west boundary. The course of all the important rivers is toward the south and south-east. Only about a fifth of the entire area of the state is under cultivation; but owing to the diversity of climate and soil, the productions are wonderful in their variety. The islands that fringe the coast are fertile in cotton of a superior quality: the bottom lands of the great rivers produce rice, cotton, Indian corn, and sugar; further west are the 'pine barrens,' valuable for their timber, and easily cultivable; the central region consists of a loamy soil, once productive, but now impoverished; and the north, the Cherokee country, contains lands which, although long worked by the Indians, still produce from 50 to 76 bushels of grain to the acre. Gold, though not now sought for, was once found here in some quantity; silver, copper, iron, lead, marble, and precious stones also occur. In 1858, G. had upwards of twenty lines of railway, whose total length reached to more than 1200 miles. The public debt of G.—to be paid in instalments at stated periods—amounted in October 1860 to 3,170,750 dollars, the interest of which was 164,775 dollars a year. The balance in the treasury, October 1860, after the payment of all expenses, amounted to 274,820 dollars. The value of the exports in 1857 was 10,857,634 dollars; and of the imports in the same year, 779,909 dollars. G. is divided into 112 states; capital, Milledgeville. G. was the latest colonised of the original states, the first settlers landing at Charleston in January 1733.

GEORGIA, the name formerly applied in a general manner to the region now called Russian Transcaucasia (see TRANSCAUCASIA), which forms the isthmus connecting Europe with Turkey-in-Asia, and is bounded by the Caucasian mountains on the north, and by the Armenian mountains on the south. The Persian name is Gurjestan; the Russian, Grusia; and the native, Iberia; the name of G. arose either from the numerous kings called George that ruled over the country, or from the patron saint being St George.

The early history of the Georgians, who trace their origin to Thargamos, a great-grandson of Japhet, is wrapped in fable. Mtskhethos, who is said to have built Mtsketha, the ancient capital of the country, the ruins of which are still visible near Tiflis, plays a prominent part in it. They appear, however, in authentic history in the time of Alexander the Great, to whom they submitted. After the death of Alexander, in the year 324 B. C., they were delivered from a foreign yoke by Pharnawas, and united in one kingdom. With Pharnawas begins the series of the Mephê or kings of G., who, under a variety of dynasties, ruled the country almost without interruption for more than 2000 years. By the end of the 4th c., Christianity had diffused itself throughout the country, and through it G. became connected with the Eastern empire, with which it joined in repelling the attacks of the Sassanides. After the empire of the Sassanides had been destroyed by the Arabs, the latter carried their conquests into G., which now became a province of the Arabian Califate. Toward the end of the

9th c., during the decline of the Arabian Califate, the Georgians recovered their independence for a short period, but it was only to become tributary in the 10th c. to those dynasties which, in Persia, took the place of the Califs. Toward the end of the 10th c., they again achieved independence, and inaugurated the most brilliant era in Georgian history; for from this period to the 13th c., when they were conquered by the Mongols, G. was governed by a series of able sovereigns, who increased its extent, repulsed its enemies, and raised it to great prosperity. Toward the end of the 14th c. the country fell into the hands of Timour, who, however, was driven from it in the beginning of the following century by George VII. Alexander I., the successor of George VII., committed the fatal error of dividing the kingdom between his three sons. Each of these states was again divided, and at one time 26 different princes reigned in Georgia. The general history of G. now divides into two parts: that of the eastern states, Karthli and Kacheth; and that of the western states, including Imereth, Mingrelia, and Guria. From the 16th to the 18th c., the eastern states had been heavily oppressed by Persia, and in 1799 Gregory XI., after many attempts to establish their independence, resigned the states in favour of Paul Emperor of Russia, and in 1802 the Emperor Alexander proclaimed the territory a Russian province. Of the three states forming Western G., Guria fell into the hands of Russia in 1801, and formally surrendered itself to that empire by the treaty of 1810; Mingrelia was virtually added to Russia in 1803; and the state of Imereth toward the close of the 18th century. Thus the whole of G. has been brought under the dominion of Russia, and has been united, along with the other Transcaucasian possessions of that country, into a general government, the head of which unites in his own person the military and civil powers, and exercises military supremacy over the whole of the Caucasus. For the character of the country of G., and for its capabilities, see TRANSCAUCASIA.

The Georgians are one of that numerous group of nations or tribes that inhabit the Caucasus, to which Dr Latham has given the name of Dioscurians (see CAUCASUS). They are celebrated for their beauty, and under the Mohammedan rule, the white slaves of Western Asia and of Egypt were mostly drawn from among them and the Circassians. Though endowed by nature with mental no less than physical advantages, the long course of oppression to which they have been subjected has had its effect both upon their intelligence and their morality. Despite the long supremacy and cruel tyranny of their Mohammedan conquerors, they have, as a nation, remained faithful to the Christian religion, according to the doctrines of the Greek church. In Guria, however, nearly half the inhabitants have gone over to the religion of Islam. The condition of the people, although somewhat ameliorated under Russian rule, is on the whole deplorable.

The language of the Georgians is harsh, but regular and forcible. It has a peculiar structure, and Dr Latham considers it as having nearer affinities with the Tibetan and other monosyllabic tongues, than with the Aryan. The literature, which is not altogether unimportant, begins with the introduction of Christianity into the country, and consists chiefly of ecclesiastical writings, translations of the Bible, the fathers, Plato, Aristotle, and their commentators. Profane literature flourished chiefly in the 17th c., and consists mainly of poetry and chronicles, particularly of an ecclesiastical character. A few heroic poems may be traced back to the time of Queen Thamar (1184—1206). Scientific works are few in number, and with the exception of a few historical works, are of no importance. Recently, however, a greater zeal in the cultivation of the sciences has begun to shew itself among the Georgians, and under the Russian government the system of education and instruction has progressed considerably. On the other hand, it must be regarded as a circumstance unfavourable to the mental culture of the country, that, in 1807, the archives and scientific works of G. were conveyed to St Petersburg. The person most thoroughly conversant with the language, literature, and history of G. is Brosset. Besides the translation of a Georgian chronicle, he has published, among other works, the *Elements de la Langue Georgienne* (Paris, 1837), the *Rapport sur un Voyage Archéologique dans la Georgie et dans l'Arménie, exécuté en* 1847—1848 (Petersburg, 1850—1851), *L'Histoire de la Georgie*, in Georgian and French, and *Additions et Eclaircissements à l'Histoire de la Georgie* (Petersburg, 1851).

GEORGIA BARK. See PINCKNEYA.

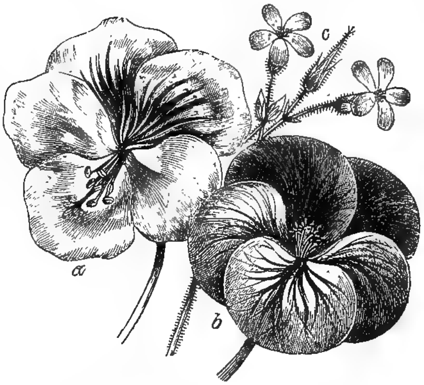
GEORGSWALDE, a small town on the northern border of Bohemia, 64 miles north of Prague. It has a mineral spring and some manufactures of linen. Pop. 5100.

GEOTEU'THIS, a genus of fossil calamaries, peculiar to the Oolitic period. The shell or horny pen is broad and truncated in front, and pointed behind, with the lateral wings shorter than the shaft. Some specimens from the Oxford clay are remarkably preserved, still shewing the muscular mouth, the bases of the arms, and the ink-bag. The ink has been made into Sepia. Some of the ink-bags from the Lias are nearly a foot long, and are invested with a brilliant nacreous layer. Upwards of a dozen species have been found.

GERA, a town of Germany, the chief place in the small principality of Reuss, is pleasantly situated on the right bank of the White Elster, 35 miles south-south-west of Leipsic. It is handsomely built, with broad and regular streets, and has six squares, a castle, a fine town hall, and several religious and educational institutions. There are extensive manufactures of woollen and cotton goods, also machine making, and manufactures of soap, gloves, leather, hats, tobacco, waxcloth, ironware, stoneware, and porcelain. In 1850, 4925 looms were employed here in the production of woollen goods, which are exported to various parts of the world to the value of about £450,000 annually. Pop. 12,000.

GERA'CE, an ancient commercial town in the south of Italy, chief town of the district of the same name, in the province of Calabria Ultra I., occupies a beautiful and fertile situation on the upper slopes of the Apennines, at about four miles distance from the Ionian Sea. On the destruction of the ancient town of Locri by the Saracens in the 12th c., the inhabitants, out of the ruins of their homes, constructed a new settlement about four miles from the site of Locri, on the seashore, and called it Santa Ciriace, which has since become *Gerace.* This town has suffered severely from repeated earthquakes, in one of which, in 1783, both the cathedral and the citadel, a fortress of great strength, were reduced to ruins. In a neighbouring plain are seen ruins supposed to occupy the site of Locri Epizephyrii, an important city of Magna Grecia, celebrated by Pindar in more than one of his odes. Coins bearing the epigraph of Locri have been found in the vicinity of the ruins, and together with the Greek character borne by the ruined edifices, seem to support this supposition. The modern G. is well-built, and owes its commercial prosperity to its silk factories and its trade in wine, a sweet white kind of which, known as 'Il Greco di Gerace,' is deservedly held in high repute. Pop. 5900.

GERA'NIUM, a genus of exogenous plants, the type of the natural order *Geraniaceæ*, the limits of which correspond with those of the Linnæan genus.



a, Geranium; *b*, Pelargonium;
c, Herb Robert (*Geranium Robertianum*).

This order contains at least 500 known species, very unequally distributed over the world, and particularly abounding at the Cape of Good Hope, of which country most of the species of the large genus *Pelargonium* are natives—a genus distinguished by an irregular corolla and by a nectariferous tube running down the flower-stalk. Many species of *Pelargonium*, and many fine hybrids and varieties produced by cultivation, are to be seen in green-houses, and some of them are frequent in cottage-windows. The name geranium is still very frequently given to them. The British *Geraniaceæ* are thirteen species of *Geranium* and three of *Erodium*, all herbaceous. Some of them are common weeds in fields and gardens, with small flowers; others have large and beautiful flowers, and are among the finest ornaments of groves and meadows. Some species of *Geranium* are often cultivated in flower-gardens. The name *Geranium* (Gr. *geranos*, a crane), the popular English name *Crane's-bill*, and the German *Storchsnabel*, all refer to the beaked fruit. The *Geraniaceæ* are generally characterised by astringency; many have a disagreeable, others a pleasantly aromatic and resinous smell, some a delightful fragrance. The STINKING CRANE'S-BILL or HERB ROBERT (*Geranium Robertianum*), a common weed in Britain, with a diffuse habit, deeply divided leaves, and small flowers, has been used medicinally as an astringent, and in nephritic complaints. *G. maculatum*, a North American species, with flowers of considerable beauty, is the most valuable medicinal plant of the order. Its root, called ALUM ROOT in America, is extremely astringent, and abounds in tannin: it is used for gargles and as a medicine in various diseases.

A few *Geraniaceæ* produce edible tubers: those of *Geranium tuberosum* are eaten in the south of Europe; those of *G. parviflorum* in Van Diemen's Land, where they are known as *Native Carrot;* and those of *Pelargonium triste* at the Cape of Good Hope. The leaves of *Pelargonium acetosum* and *P. peltatum* are edible, and gratefully acid. The cultivated *Geraniaceæ* are propagated by seed or by cuttings; the shrubby kinds are very easily propagated by cuttings. They require a light rich soil: a mixture of leaf mould and sand is very suitable. They are kept low by pruning, to increase their beauty and make them more productive of flowers.

GÉRARD, ETIENNE-MAURICE, COMTE, Marshal of France, was born at Damvilliers, in Lorraine, on the 4th of April 1773. He enrolled as a volunteer in the second battalion of the Meuse, and served during the campaign of 1792—1793 under Dumouriez and Jourdan, and afterwards accompanied Bernadotte on his embassy to Vienna, where he was the means of saving his master's life in the mêlée that ensued on his arrival. After rising rapidly through the different grades of promotion, he was appointed colonel on the 15th November 1800, and in 1805 aid-de-camp to his friend Bernadotte. He specially distinguished himself at Austerlitz (1805), in consequence of which he was appointed general of brigade, at Halle (1806), Jena (1806), Erfurt (1806), Lintz (1809), and Wagram (1809). On the morning after this last battle, he received the title of Baron of the Empire. He took part both in the wars of the Spanish Peninsula and in the Russian campaign; and in 1812 was made a general of division. Subsequently, Napoleon named him Count of the Empire. After the first restoration, he was named Grand Cross of the Legion of Honour, and Chevalier of St Louis, and received various honourable appointments. On the return of Napoleon from Elba, G. joined him, and commanded the fourth corps, numbering 16,000 men. At the battle of Ligny, G. was opposite to the centre of the Prussian position, which covered Ligny, and was thus in the hottest of the fight. On the morning of the 18th of June, G. was near Wavres, when firing was heard in the direction of Soignies, upon which a council was called, and if G.'s advice had been taken, the battle of Waterloo might perhaps have had a different result. After the second restoration, G. was obliged to leave France, and did not return till 1817. He was elected a member of the Chamber of Deputies in 1822; he also took an active part in the revolution of 1830, and commanded the troops appointed to maintain order and tranquillity in Paris. In 1831, Louis Philippe appointed G. a marshal of France, and gave him the command of the expedition to Belgium, in the course of which he distinguished himself by taking Antwerp in December 1832. In 1835 he succeeded Marshal Mortier as Grand Chancellor of the Legion of Honour. He died 17th of April 1855.

GÉRARD, FRANÇOIS PASCAL, BARON, one of the first historical and portrait painters of the modern French school, was born at Rome, 11th March 1770. At an early age, he went to France, and was apprenticed to Pajou, the sculptor, in Paris. He afterwards worked for some time in the studio of the painter Brenet, and in his 16th year became the pupil of David, but his artistic career was interrupted for several years by the Revolution. In 1795, he exhibited his first picture, 'Belisarius;' some time after, he painted 'Psyche receiving the First Kiss from Cupid.' Encouraged by his success, he now turned his attention to portrait-painting. Having gained Napoleon's favour, he was loaded with honours, and received, among other commissions, that of painting the Battle of Austerlitz, perhaps the most successful of his paintings illustrating the campaigns of Napoleon. But his grandest work—both as regards size and merit—is his 'Entrance of Henri Quatre into Paris.' It is 30 feet wide by 15 high, glowing with life, bright with colour, and accurate in costume. It was painted in 1817. G. was shortly after appointed first court-painter, and raised to the rank of Baron by Louis XVIII. He died at Paris, 11th January 1837. G.'s most celebrated portraits are those of Napoleon in his Coronation Robes, the Queen of Naples and her Children, Talleyrand, Talma, Louis Philippe, and Madame Récamier. Of his other pictures, the best known are 'Ossian's Dream' (engraved by Godefroy), 'Homer' (engraved by Massard), 'Daphnis and Chloë,' 'Philip V.,' 'Corinna on the Promontory of Misena,' 'St Theresa Kneeling at the Altar,' and 'Thetis Bearing the Armour of Achilles.'

GERA'SA, in the time of the Romans, was a city of Palestine, on the eastern borders of Peræa. It was situated among the mountains of Gilead, about 20 miles east of the Jordan, and 25 north of Rabbath-Ammon, and attained a high degree of prosperity under the Antonines (138—180 A.D.). On the rise of Christianity, it became the seat of a bishopric, but subsequently sunk into decay. G. is now deserving of notice solely on account of its ruins, which are said to be the most beautiful and extensive in that part of Palestine lying east of the Jordan. In fact, it presents the appearance of a city in ruins, but which still preserves its original outlines. Great portions of the wall surrounding the town are in good preservation; three of the gateways are almost perfect, and within the city more than 230 columns are still standing on their pedestals.

GERBI, GERBA, or JERBA (the Meninx of Strabo and Pliny), a small island on the north coast of Africa belonging to the state of Tunis, is situated in the Gulf of Cabes, and is separated by a strait from a headland on the shore. It is about 20 miles long and 12 miles broad, and is fertile and populous. Shawls of brilliant colours, beautiful silk and woollen fabrics of the finest texture, bornous and blankets, are manufactured. This island contains a triumphal arch in honour of Antoninus and Verus, and a pyramid from 25 to 30 feet in height, built up of the skulls of the Spanish soldiers who fell here in a disastrous battle with the Turks in the 6th century.

GERHARDT, Karl Friedrich, an eminent chemist, was born at Strasburg on the 21st of August 1816, and died in that city on the 19th of August 1856. At the age of fifteen, he was sent to the Polytechnic School of Carlsruhe, where his attendance at Professor Walchner's lectures first awaked in his mind a taste for chemistry. After two years' residence in this town he removed to Leipsic, where he attended the lectures of Erdmann, which seem to have developed in him an irresistible passion for questions of speculative chemistry.

On his return home, he reluctantly entered upon the business of his father, who was a manufacturer of chemical products; but the requirements of commerce seem to have been intensely repugnant to him, and in a hasty moment of passion he enlisted (being now in his twentieth year) in a regiment of chasseurs. He soon, however, found a military life as insupportable as a commercial career, and in the course of three months he purchased his discharge, and at once set out for the laboratory of Giessen, where he worked under Liebig's superintendence for eighteen months. In 1838 he arrived in Paris, where he was cordially welcomed by Dumas. Here he gave lectures and instructions in chemistry, and, with Chevreul's permission, worked in the laboratory of the Jardin des Plantes, where, in association with his friend Cahours (to whose memoir of G. we are indebted for many of the facts noticed in this article), he commences his important researches on the essential oils. In 1844 he was appointed professor of General Chemistry in the Faculty of Sciences at Montpellier, and in the same year he married the youngest daughter of the late Dr James Sanders of Edinburgh. About this time he published his *Précis de Chimie Organique*, in which he sketches the idea of 'Homologous and Heterologous Series' (q. v.), which at a later period he so successfully developed. In 1845, in association with Laurent, he commenced the *Comptes rendus des Travaux de Chimie publiés en France et à l'Etranger*, which were continued till 1848. In 1848, he resigned his chair and returned to Paris, in order to follow out uninterruptedly his special investigations; and in that city he established, between the years 1849 and 1855, in successive memoirs, his views of series (already adverted to) and the theory of types, with which his name will be ever associated in the history of chemistry. It was there, also, that he gave to the scientific world his remarkable researches upon the anhydrous acids and the oxides. All his ideas and his discoveries are embodied in his *Traité de Chimie Organique* (1853—1856, 4 vols.), which forms, to use the words of his friend and biographer Cahours, 'an important monument of modern science.' He had hardly completed the correction of the last proof of this great work, when, after an illness of only two days, he was surprised by the hand of death at the very period when he seemed to be beginning to enjoy the fruit of his labours; for he had just received the diploma of corresponding member of the Academy of Sciences at Paris, and in the previous year he was appointed professor of chemistry at Strasbourg.

GERHARDT'S NOTATION is now introduced, not only into numerous foreign works on chemistry, but into some of our recent English manuals—as, for example, Comington's *Handbook of Chemical Analyses*, Odling's *Manual of Chemistry*, &c.; and being employed by a large section of English chemists—as, for example, Professors Williamson, Brodie, Hofmann, and Odling—requires a brief notice. On certain theoretical grounds, Gerhardt has doubled the combining or equivalent numbers of oxygen, carbon, sulphur, selenia, and tellurium; the other numbers remaining unaltered. We give in the following table the ordinary and Gerhardt's numbers:

	Ordinary Equivalent.	Gerhardt's Equivalent.
O,	8	16
C,	6	12
S,	16	32
Se,	39·75	79·5
Te,	64·5	129.

The examination of a few formulæ will readily enable the reader to translate from one system into the other:

Compounds.	Ordinary Formulæ.	Gerhardt's Formulæ.
Water, ...	HO	H_2O
Potash, ...	KO	K_2O
Hydrate of Potash, .	$\mathrm{KO,HO}$	$\mathrm{KH}O$
Hydrated Nitric Acid, .	$\mathrm{HO,NO_5}$	$\mathrm{N}O_3\mathrm{H}$
Hydrated Sulphuric Acid,	$\mathrm{HO,SO_3}$	$SO_4\mathrm{H}_2$
Hydrated Acetic Acid, .	$\mathrm{HO,C_4H_3O_3}$	$C_2\mathrm{H}_4O_2$
Alcohol, ...	$\mathrm{HO,C_4H_5O}$	$C_2\mathrm{H}_6O$

In Gerhardt's formulæ we have printed in italics the symbols whose equivalents are changed. Each system of notation has its advantages, but upon the whole we are inclined to agree with Professor Miller, that 'the question to be considered is not simply, what is in the abstract the best mode of notation, but what, considering all the circumstances of the science, possesses the greatest advantage. That system of notation which is consistent with itself, and which lends itself most completely to the expression of the various theories and aspects of the science which have been maintained, or may be maintained, is therefore, philosophically speaking, the best. And such grounds, it appears to me, exist for continuing to use the system hitherto adopted.'

GERI'ZIM AND E'BAL, two mountains celebrated in Scripture story. They are separated from each other by a narrow valley about 200 yards wide, in which stands the town of Nâbulus, the ancient Shechem or Sychar, the metropolis of the Samaritan sect. They are nearly equal in altitude, neither of them exceeding 700 or 800 feet above the level of the valley, which, however, is itself 1800 feet above the sea. The view from the top of Mount G., the southern hill, is said to be among the finest in Palestine, embracing, as it does, glimpses of the blue waters of the Mediterranean on the west, the snow-capped heights of Hermon on the north, and on the east the wall of the Trans-Jordanic mountains, broken by the deep cleft of the brook Jabbok.

In all probability, Mount G., and not the mere hillock called Moriah, on which Solomon afterwards built the Temple, was the place where Abraham offered up his son Isaac. Along with Mount Ebal, it was also the scene of a grand and impressive ceremony, in which the whole people of Israel took part after crossing the Jordan, in obedience to a command which Moses had given them. Half of the tribes stood upon the declivities of the one hill; the rest occupied the sides of the other, while in the valley between, the Levites, surrounding the sacred ark, pronounced, 'with loud voice,' the blessings affixed to the performance of the law, and the curses affixed to the neglect of it. According to the Mishna, their manner of procedure was as follows: They first turned towards Gerizim, and pronounced the blessing, whereupon the vast host that thronged the ascent of that hill rolled back their multitudinous 'Amen;' then turning towards Ebal, they uttered the corresponding malediction, to which the tribes there stationed responded in deep and solemn tones. In this way, alternating blessing and curse, they went through the whole series. The narrative of the ceremony (which is to be found in the 27th chapter of Deuteronomy) gives only the curses—the customary explanation of which fact is, that probably these were merely the reverse form of the blessings, and may have been selected by the writer of the book on account of the greater awe inspired, among a rude people, by a malediction than a benediction. At a later period the Samaritans, by permission of Alexander the Great, built a temple on Mount G., as a rival to that of Jerusalem, and organised a rival priesthood. And though this temple was destroyed by Hyrcanus about 200 years after, the mountain on which it stood continued to be held sacred by the Samaritans. It was to Mount G. that the 'woman of Samaria' referred when she said to our Saviour: 'Our fathers worshipped in *this* mountain, and ye say that in Jerusalem is the place where men ought to worship.' Subsequently, a Christian church in honour of the Virgin was built on it, which Justinian surrounded with a strong wall to protect it against the assaults of the Samaritans, who were even then a powerful and important sect. The ruins of this wall are still visible.

GE'RKI, a considerable town of Africa, is situated in the Sûdan, in the district of Sokoto, in lat. 12° 26′ N., and long. 9° 10′ E. It is surrounded by a wall surmounted with pinnacles. Its inhabitants are notorious for their thievish propensities, and for their aversion to agriculture, and, indeed, to any form of industry. Population estimated at 15,000.

GERLACHE, ETIENNE CONSTANTIN, BARON DE, a native of the province of Luxemburg, in Belgium, was born on the 26th December 1785. In 1824, he was elected as deputy from the province of Liege to the second chamber of the 'States General.' At the time of the Revolution, G. presided over the committee appointed to revise the constitution, and was head of the deputation sent to offer the crown to Prince Leopold of Saxe-Coburg. In 1831, he became president of congress, and in that capacity received the oath exacted from the king by the constitution, and the following year was appointed first president of the 'court of cassation.' In 1843, the king conferred on him the title of baron. Since his election as deputy in 1824, he has supported the Catholic party, and is now considered as one of their chief leaders. G. has also acquired a literary reputation. The most important of his works are the following: *Memoires sur les Changements à apporter aux Tarifs du Royaume*, which appeared between 1821 and 1824, and were addressed to the king; *Histoire du Royaume des Pays-Bas, depuis* 1814 *jusqu'en* 1830 (Brussels, 1839), besides other works of local interest.

GERMAN, SAN, a town in the south-west of the Spanish island of Porto Rico, stands in lat. 18° 10′ N., long. 67° W. It is situated about 10 miles from the sea, in the centre of a district productive in cotton, coffee, and cattle. Its population is estimated at 9125.

GERMAN BARM. See YEAST.

GERMAN CATHOLICS is the name generally given to a religious sect that has recently sprung up in Germany in the bosom of the Roman Catholic Church. Though retaining the designation Catholic—i. e., universal—they form independent congregations, and most commonly style themselves Christian Catholics. So far as their general principles are concerned, the G. C. stand upon Protestant ground; but neither in theory nor practice are they evangelical Protestants, nor do they wish to be accounted such.

Whatever might be the deeper causes of the schism, the immediate occasion of it was the exhibition of the Holy Coat at Treves. In 1844, Bishop Arnoldi appointed a special pilgrimage and service to this relic, to be preceded by confession and remission of sins. This proceeding called forth a protest from J. Ronge (pronounced Rongé, the *g* hard), a priest in Silesia, who, having quarrelled with the authorities of his church, had been suspended from his office, and was living in retirement. Ronge addressed a public letter to Bishop Arnoldi, October 1, 1844, in which he characterised the exhibition of the coat as idolatry. Ronge's voice found a vivid response in the minds of many Catholics, and was also approved by Protestants.

A short time previous to the publication of this letter, J. Czerski, a priest at Schneidemühl, in Posen, had seceded from the Roman Catholic Church, and was about to form a congregation of 'Christian Apostolic Catholics.' Czerski and Ronge were naturally drawn into confederacy. Ronge at last addressed an appeal to the lower orders of the priesthood, calling upon them to use their influence in the pulpit and everywhere to break the power of the court of Rome, and priestcraft in general, throughout Germany; to set up a national German Church independent of Rome, and governed by councils and synods; to abolish auricular confession, the Latin mass, and the celibacy of the priests; and to aim at liberty of conscience for all Christians, and perfect freedom for the religious education of children.

The first congregation of the new church was formed at Schneidemühl, and took the name of Christian Catholic. The confession of faith, which was drawn up by Czerski, differed little in point of doctrine from that of the Catholic Church. The Holy Scriptures and the Nicene Creed were held to be the only standards of Christian faith, and were to be understood in the sense patent to every enlightened and pious Christian. Nothing was said against the worship of saints and relics, pilgrimages, confession, &c. This Confession of Schneidemühl served many other congregations as a groundwork, though some of them modified it in various ways, and expressed themselves more definitely. The new sect quickly increased. At the beginning of 1845, more than a hundred congregations were in existence. The congregation which was formed at Breslau is noticeable from the confession of faith which it issued, drawn up under the influence of Ronge, who had been chosen preacher. This confession completely departed from the doctrine and ritual of the Roman Catholic church. The Scripture was laid down to be the only rule of Christian faith, and no external authority, it was added, can be allowed to interfere with the free interpretation of it. The essentials of belief were restricted to a few doctrines: belief in God as the Creator and Governor of the world, and the Father of all men; in Christ as the Saviour, in the Holy Spirit, the holy Christian Church, the forgiveness of sins, and eternal life. Baptism and the Lord's Supper were held to be the only sacraments. Confirmation was retained, but most of the rites and practices peculiar to the Roman Catholic church were given up.

The need of something like concert being felt, the first council of German Catholics was held at Leipsic, March 22, 1845, and attended by deputies from many of the leading congregations, others signifying their willingness to abide by the decisions that might be come to. The principles of the Breslau Confession were mostly adopted. The interpretation of Scripture, the only source of Christian belief, was left to the free exercise of reason, pervaded and actuated by the 'Christian idea.' Forms of worship were to be adapted to the requirements of time and place. With regard to church government, the council declared in favour of the presbyterial and synodal constitution. The congregations were to have the free election of their clergy and eldership.

The effect of this union was to increase the number of congregations, which by the end of 1845 amounted to about 300. Numbers of leading Catholics, professors and others, joined the movement; and learned Protestants, like Gervinus, looked upon it as a momentous event in the history of Germany. Individual Protestant clergymen went over to the body; and all those Protestants who, from dissatisfaction with the state church, had formed what are called 'free' or independent congregations, entered more or less into relations with it. The local boards and magistracy also shewed great favour to the cause, and often supported it by granting the use of Protestant churches, and even funds.

But German Catholicism was destined soon to find enemies both within and without. To say nothing of orthodox Catholics, conservative Protestantism began to suspect it as an undermining of religion in general, and dangerous to the welfare of 'church and state.' And as the movement fell in with the liberal tendencies of the times in general, the governments took the alarm, and set themselves to check its spread. Saxony took the lead, and Prussia soon followed, in imposing vexatious, and even tyrannical restrictions upon the 'Dissidents,' as they were styled by the authorities. In Baden, they were even denied the rights of burghers, while Austria, pre-eminent in religious bigotry, sent them out of her territories.

It was more, however, internal disagreements than state persecutions that checked the prosperity of German Catholicism, as was to be anticipated from the wide discrepancy between the views of Czerski and those of Ronge. Czerski and his adherents held closely by the doctrines and ritual of Rome, and issued successive confessions, laying down more and more definitely the essential points of belief, such as the divinity of Christ, and other positive doctrines. Ronge's party, on the other hand, approached nearer and nearer to the Rationalists, and, leaving the province of religion altogether, occupied themselves with free-thinking theories and democratical politics. This led to numerous disagreements between congregations and clergymen, and discouraged the spread of the movement. When the second council was held in Berlin in 1847, the interest had greatly declined.

When the great storm of 1848 burst, the German Catholics, as well as other bodies, had free space for their exertions, which, however, took mostly a political direction. Some additions were made to the number of the congregations, especially in Austria. Ronge was active in travelling and preaching, and although his freethinking and political tendencies were repudiated by numbers of the body, they predominated in many places, and found expression in a series of publications, among others, in Rau's *Catechism of the Christian Religion of Reason*, and Shell's *Book of Religion*. After the political reaction set in, strong measures were taken against the German Catholics. The early enthusiasm of the movement apparently died out, and after the dissolution of the Frankfurt parliament, Ronge retired to London, where he has since resided. The individual congregations once formed still continue to exist, though in a depressed condition, except in Austria, where they have been altogether suppressed. A conference was held at Köthen in 1850, at which it was proposed to form an alliance with the Free congregations formed of dissenters from the Protestant church, and a diet was fixed for 1852, but it did not meet. Since then, German Catholicism has been rapidly diminishing all over Germany, and at the Gotha conference of 1858 there were only 42 representatives present. Compare Kampe's *Geschichte der Religiösen Bewegungen der Neueren Zeit* (Leip. 1856).

GERMAN, COUSIN-. Cousins-german, or first cousins, are those who are related to each other by their fathers and mothers having been sisters or brothers, or the father or mother of the one being the sister or brother of the other. The term has no relation to German, in the sense of Teutonic, but comes from the Latin word *germanus*, which again is derived from *germen*, a young bud or branch. Cousins-german are, therefore, those who are the buds or branches of the same tree, and they have in reality always one grandfather in common.

GERMAN OCEAN. See NORTH SEA.

GERMAN PASTE, used for feeding birds such as larks, thrushes, nightingales, and other singing-birds, especially those which in their wild state feed chiefly upon insects. Take 2 lbs. pea-meal, ½ lb. of sweet almonds blanched, ¼ lb. of fresh butter or lard, 5 oz. moist sugar, ½ dr. of hay saffron, and 3 eggs boiled hard. Beat them into a smooth paste, using sufficient water to give it the consistence required for granulating by passing it through a colander; then expose the granulated paste to the air in a warm place until it is quite hard and dry. If properly prepared and dried, it will keep good in a dry place for a year or more.

GERMAN PHILOSOPHY. When we speak of the philosophy of Germany, we do not necessarily imply that it differs from the philosophy of any other country in respect of the problems it seeks to solve, any more than when we compare the German chemistry with that of France or England. To characterise German philosophy, means nothing more than to point out the peculiar path that German thinkers have followed, and the degree of success that has attended their investigations, in seeking to answer those speculative questions which are understood to form the domain of philosophy, and which concern all men, if they concern any. Understood in this sense, German philosophy claims a high place—according to many, the highest. At least, for almost a century now, a more general interest has been taken in the cultivation of philosophy in Germany than elsewhere, and abstruse and deep speculation has been chiefly represented by German thinkers. That country has thus made up for the ground she lost by continuing to adhere to the traditional forms of scholastic philosophy after they had been forsaken in France and England. This spread of philosophic culture was coincident with the perfecting and adaptation of the German language to prose composition. For though Leibnitz confined himself in his philosophical writings to the Latin and French languages, Chr. Thomasius, about the same time, had begun to employ the mother-tongue both in academic lecturing and in writing, a practice which was extended by the numerous writings of Chr. Wolf. The expansion of German literature in the last half of the 18th c. completely emancipated speculation from the trammels of a foreign idiom, and alongside of a rich poetical literature there sprang up a philosophy which may claim comparison with that of Greece.

As regards the scientific characteristics of German philosophy, it may be remarked that the systems put forth by Bacon in England, Descartes in France, and Spinosa in Holland, had but little influence in Germany at the time of their appearance. It was Locke that first awakened any considerable attention. The empiricism of this philosopher, who grounds all knowledge on experience, and makes psychology the regulator of metaphysic, called forth the opposition of Leibnitz, the first German that made an epoch in the history of modern philosophy, and who, from the varied impulse he communicated, must be looked upon as the creator of the philosophic spirit in Germany. At the same time the fundamental doctrines of Leibnitz's system—that of monads, of a pre-established harmony, and of innate ideas—were rather genial hypotheses than regularly established propositions. To remedy this, Wolf endeavoured to construct a system of philosophy complete in all its parts as required by the forms of logic, in doing which, however, he set aside precisely those doctrines that formed the characteristics of Leibnitz's philosophy. The great influence exercised by Wolf is shewn by the wide circulation of his writings, and the multitude of his disciples and adherents. Wolf himself, however, outlived his fame, and the original philosophic mind in Germany went to sleep for a period, during which a sort of Eclecticism, without any fundamental principle—the so-called philosophy of 'common sense,' prevalent in England and France in the 18th c.—became generally spread. This period, however, was not without great intellectual excitement of other kinds. Poetry, reform in education, politics, and religious enlightenment, keenly occupied men's minds; old customs and associations, both in family and political life, were shaken; and preparation was silently going on for a great and radical revolution.

Kant, with whom the next period of German philosophy begins, thus found an age ready to receive impressions; and, although the *Kritik der Reinen Vernunft* (Critique of the Pure Reason) was at first in danger of being overlooked, when a hearing was once obtained, that and his other critical works, which, after long preparation, appeared in rapid succession, communicated a profound impulse to the scientific world. This arose not more from the novelty and the comprehensiveness of his researches, than from the circumstance that their aim fell in with the tendencies of the age. The exclusion of everything dictated by caprice or sentiment, the maintenance of the independence of speculative inquiry, the reference of all theoretical speculation to the field of experience accessible to it, and the elevation of the moral element to the highest and ultimate object of all human endeavour, form the leading traits of his philosophy, which he recommended to consideration, more from its importance to man and society than to philosophers. He also entertained the hope that, through the critical inquiry into the nature of the human mind, it might be possible to reconcile empiricism and rationalism, sensualism and spiritualism, and other philosophical opposites, and discover a series of comprehensive principles to which all philosophical disputes might be referred in the last resort. This hope was disappointed; among other causes, because Kant sought to ground the old metaphysic of the schools on a psychology which itself rested on the basis of that metaphysic. Besides, there was wanting in the heyday of Kantism any satisfactory point of unity for the several parts of philosophy. K. L. Reinhold was the first to point out this defect; and scepticism, as in C. Schulze's *Ænesidemus*, and dogmatism in the writings of Eberhard and others, carried on a war with the 'critical' philosophy, but not, it must be confessed, with any great success. It was Fichte who found, or thought he had found, in the fact of consciousness, that absolute point of unity which Kant's 'Critique' had always pointed to. Fichte, following out the path on which Kant had entered, changed the half-idealism of Kant into a complete idealism, by declaring the Ego to be, not only the bearer and source of knowledge, but the only reality, the world being merely the ideas and active manifestations of the Ego. In the ego, being and knowing were identical, it was at once existence and knowledge, and nature appeared only as the reflex of its absolute activity.

With this idealism began a kind of revolutionary excitement in the philosophising minds of Germans, which contrasted strongly with the calm and sober spirit of Kant. System followed system; philosophical books appeared in shoals; and for a quarter of a century and more the interest was shared by the public in general. But the meteors that appeared in the philosophical sky of Germany vanished for the most part as suddenly as they had blazed forth. Schelling was the first that attained a general influence. F. H. Jacobi had previously recalled attention to Spinosa, and Schelling, influenced by the speculations of Spinosa, converted the idealism of Fichte into what is called 'the philosophy of identity.' This system set out originally with the assertion, that as Fichte educes nature out of the ego, so by an inverse process the ego may be educed out of nature; but that both these forms of philosophising have their ground in the *absolute* as the *identity* of all opposites—of the real and the ideal, of subject and object, of mind and matter. In carrying out this assertion, Schelling fixed upon intellectual intuition as the kind of cognition alone corresponding to the absolute, or rather as identical with and representing the absolute. The organ of this intuition was called reason, and, as such, was opposed to the reflection of the understanding, which was held to be quite incapable of taking cognition of the absolute. The relation of the phenomenal world to the absolute was held to consist in this, that the absolute represents itself in the multiplicity of appearances, steps out of the state of 'indifference' into that of 'difference,' manifests itself in 'difference,' &c. Taking special cases, particularly in natural philosophy, Schelling endeavoured to demonstrate the existence of this identity in the midst of non-identity, and of non-identity in the midst of identity. In this attempt, however, neither Schelling nor his disciples effected much. For in undervaluing and neglecting experience and reflection, the door was opened to a fanciful mode of speculation, which in most cases had little more in common with science than the name; so that in the departments of poetry, religion, and social life, the Schelling philosophy often degenerated unto a blind groping, leading to the strangest aberrations of romanticism, mysticism, and tendency to Catholicism.

The philosophy of Hegel (q. v.) took the same general direction as that of Fichte and Schelling. Hegel attempted to develop, in regular organisation, the contents of the intellectual intuition (in plain words, the cognitions and ideas of the mind) by the dialectic or logical method. Though he broke loose from the prevalent fashion of indulging in an unbridled play of fanciful combinations, he did not content himself with the rules of logic recognised for thousands of years, but sought an expression for speculative thought in a dialectic of his own. The essence of this transcendental logic consisted in the analysis of all the established general conceptions; and the process or method consists in making each conception of itself generate its opposite, and, combining with this opposite, thus become enriched and enabled to advance to still higher stages. This method Hegel, with enduring perseverance, endeavoured to carry out through the whole field of philosophy; and divided his system into the three provinces of logic, philosophy of nature, and philosophy of mind.

While the systems above considered form pretty much a continuous line of progress, that of J. F. Herbart (q. v.), on the contrary, arose in opposition to the idealism of Fichte, and took a direction in complete antagonism to the dominant secular philosophy; and when we have named Herbart, along with Schelling and Hegel, we have named the only men that, since the era of Kant and Fichte, can lay claim to extended and general influence. For the well-nigh innumerable productions of other thinkers in this department, though often of individual merit, are only of secondary importance for the development of philosophy as a whole. None of them opened up any new leading path; they are occupied chiefly in defending or remodelling older systems, and applying them to particular departments of science, or in controversy with the dominant philosophy of the day. To this category belong the Kantian systems of Krug and others; the physical speculations of Steffens, Oken, Schubert, &c.; the various attempts to lead back philosophy to empirical psychology; the peculiar speculative attempts of Schleiermacher, J. J. Wagner, Fichte the younger, A. Trendlenburg, &c.; the different tendencies within the Hegelian school; and lastly, the position which Schelling latterly took up with regard to his own earlier doctrines, and to the development given to them by others.

While philosophy during the last half century was thus actively prosecuted as a science, a corresponding interest was taken in its history; in fact, it was Germans who first sought to grapple with the history of philosophy as a whole, and to throw light upon the principal departments of it by valuable special treatises. See PHILOSOPHY. The rapid succession of systems one after another, and the extravagances into which some of them ran, have, it is true, produced a lull in the interest taken in speculation; and to the former enthusiasm there has succeeded a sceptical aversion to all speculative inquiry. Still the influence that philosophy has had in elevating and strengthening the scientific mind of Germany, has been powerful and beneficial; and there are few departments of research in which the fruits of the philosophic spirit may not be seen in a deeper and more thorough mode of treatment.

GERMAN SILVER, the name given to an alloy formed of copper, zinc, and nickel. It is variable in its composition according to the requirements of the manufacturer, but may be stated for general purposes to consist of copper 50·0, zinc 30·0, nickel 20·0; this composition is very malleable, susceptible of high polish, and nearly as white as silver. This is used to imitate silver in articles which are rolled and stamped, and consequently require considerable malleability. By taking 55 parts of copper, 24·4 of zinc, and 20·6 of nickel, we obtain a very beautiful alloy, scarcely inferior in beauty to silver itself. For wire-drawing and very thin rolling, a tougher alloy is formed of copper, 60 parts; zinc, 25 parts; nickel, 20 parts; and for castings the following proportions are used—copper, 60 parts; zinc and copper, each 20 parts. Many other formulæ are in use arising from difference of opinion amongst the manufacturers as to the best proportions for their respective operations, usually, however, the aim is to obtain a silvery whiteness, and the largest proportion of malleability.

This alloy must not be confounded with other white alloys, such as Albata, Britannia metal, and nickel silver, which are used as substitutes for the true German silver. The first of these is composed of copper, zinc, nickel, and a little lead; the second of copper, zinc, tin, antimony, and sometimes bismuth; and the third of copper 60·0, nickel 22·2, zinc 17·8. This last differs only in its proportions from the German silver; it has the colour of highly polished silver, and is very hard. The colour of German silver being so near that of the precious metal, it is particularly well adapted for plating either by the old process of rolling with silver, or in the newer and now generally used process of electro-plating; the advantages are that a thinner deposit of silver can be used, and the articles made are not liable to the objection of the old process of plating on copper, which as soon as the silver began to wear off was rendered apparent by its red colour.

As alloys of the nature of German silver are easily oxidised when brought in contact with free acids (as, for example, with the acetic acid contained in vinegar), and as the salts of lead, copper, and nickel, that are thus formed are poisonous, it is not expedient to use spoons, dishes, &c., composed of German silver.

The extent to which it is now used is very great indeed, and, combined with electro-depositing, it has been the means of adding immensely to the national industry, the manufacturers of Birmingham and Sheffield supplying every quarter of the globe with a profusion of articles of taste and utility in electro-plate in beautiful designs, and rivalling genuine silver-plate in beauty of appearance.

German silver derives its name from the fact that it was first made at Hildburghausen, in Germany, where it was made by smelting the ores of the metals above-mentioned, and a small proportion of iron ore also; this last, however, is very rarely used now, although it adds to the silvery whiteness of the alloy, but it renders it more brittle.

GERMAN TINDER. See Amadou.

GERMA'NDER (*Teucrium*), a genus of plants of the natural order *Labiatæ*, having the calyx tubular, 5-toothed and sometimes 2-lipped; the corolla with the upper lip very short and bipartite, the lower lip spreading and trifid; the stamens much exserted. The species are numerous, and very widely distributed. A few are natives of Britain. The Common G. or Wall G. (*T. chamædrys*), often found on ruined walls, has probably been introduced from the south of Europe. It is a small, almost shrubby, perennial; with wedge-shaped ovate inciso-serrate leaves, and whorls of about three large reddish purple flowers. It is bitter, somewhat aromatic, and was formerly much used in medicine, particularly in cases of gout. It was a principal ingredient in a once famous gout medicine called *Portland powder.*—Similar medicinal virtues were ascribed to *T. Botrys*, a small annual species common on dry hills in Germany; with aromatic fragrance and yellow flowers. Wood G. or Wood Sage (*T. scorodonia*) is a very common British plant, growing in dry bushy or rocky places, with oblong-ovate very much wrinkled leaves, and one-sided racemes of yellowish-white flowers. It is very bitter and slightly aromatic. It is used in Jersey instead of hops.—Water G. (*T. scordium*), a rare British species, growing in wet meadows, has a smell resembling that of garlic. It had once a great reputation in medicine.—Cat Thyme (*T. Marum*), a native of the south of Europe, abounds in a pungent volatile oil, has a camphor-like smell, and—like catmint and valerian root—has great attractiveness for cats. It is often used as a sternutatory; and its powder snuffed into the nose has proved very beneficial in cases of polypus.—A species found in Cochin-China (*T. thea*) is used there in infusion as tea.

Germander, or Wood Sage (*Teucrium Scorodonia*): *a*, corolla; *b*, calyx, with pistil.

GERMA'NIA was the general name under which the Romans designated not only great part of modern Germany, but also a portion of Belgium and the north and north-eastern districts of Gaul, the two last being more especially characterised as 'Germania Prima' and 'Secunda,' while Germany proper was also called 'Germania Magna,' 'Germania Trans-Rhenana,' or 'Germania Barbara.' The boundaries of the region comprehended under these designations were—on the west, the Rhine and Celtic Gaul; on the east, the Vistula and the Carpathian Mountains; on the south, the Danube; and on the north, the sea, which was divided by the Cimbrian Chersonesus (Jutland) into the German and the Suevic (Baltic) seas. The first occurrence in connection with the history of the people of G. with which we are acquainted, was the appearance of warlike tribes of Cimbri and Teutones in the present Steiermark or Stiria, where they defeated the Roman consul Papirius, in the year 113 B.C. Eleven years later, they again came into collision with the Roman arms, but the result was their signal defeat by Marius. The names Germani and Germania do not seem to have been appellations in use among the people themselves; and it is probable that the Romans borrowed them from the Gauls or Celts, in whose language the word 'gairm,' a loud cry (like the Homeric *boèn agathōs*, 'good at the war-shout'), may possibly have served to designate this people, whose habit it was to accompany their attack on an enemy by loud cries. The Tungri were the first German people that crossed the Rhine, but other tribes soon followed; and when Julius Cæsar opened his Gallic campaigns (58 B.C.), he found the Germanic nations of the Triboci, Nemetes, and Vangiones in possession of the districts lying between the left bank of the Rhine and the Vosges, while he even encountered a rival pretender to the supremacy of Gaul in the person of Ariovistus, the leader of the Suevic tribe of the Marcomanni. All these tribes were, however, finally reduced to subjection with the rest of Gaul, while the Tencteri and Usipetes, who had invaded Belgium, were driven, together with the Sicambri, across the Rhine to their former settlements by the victorious general, who for the first time (55 B.C.) led a Roman army into Trans-Rhenic Germany. The quiet which Cæsar's victories had secured in the Rhenish districts was again so seriously disturbed by the Usipetes and several of the neighbouring tribes in the year 16 B.C., that Augustus, who had hastened to Gaul on the outbreak of disturbances, saw that stringent measures must be adopted to keep the Germans in check, and sent Drusus at the head of eight legions into Germany. The first step of the Roman general was to dig a canal ('fossa Drusiana') from the Rhine to the Yssel, by which the Roman galleys could sail from the heart of the continent to the ocean; and so successful were his measures, that in the course of four campaigns he had carried the Roman arms as far as the Albis (Elbe), subdued the Frisii, Batavi, and Chauci in the north, and defeated the Catti of the Moenus (Maine) districts. Drusus, who died 9 B.C., began the series of forts, bridges, and roads which were completed and extended under succeeding commanders. The attempt made by Varus, under the direction of Augustus, to introduce the Roman provincial forms of administration into Germany, brought, however, a sudden check to the advance and consolidation of Roman power; for the tribes of Central Germany, indignant at this attempted subversion of their national institutions, ranged themselves under the leadership of Arminius, a chief of the Cherusci, who organised a general revolt. The result of this movement was the destruction at the Saltus Teutobergiensis of the three legions commanded by Varus, and the subsequent loss of all the Roman possessions between the Weser and the Rhine. The news of this disastrous event threw the city of Rome into consternation. Germanicus, who was sent forth in 14 A.D. to restore Roman supremacy, would probably have again wholly subjugated the Germanic tribes had he not been recalled by Tiberius in the midst of his victories. From this time forth the Romans ceased their attempts to conquer Germany, and contented themselves with repelling the incursions which the tribes made on their frontiers, and endeavouring by their influence to foster the intestine disturbances which were perpetually generated through the ambition and jealousy of rival leaders, such as Arminius, Marbodius, and the Goth Catualda. After the murder of Arminius by his own people, the power of the Cherusci declined, while the Longobardi and Catti began to assert a recognised preponderance among the neighbouring tribes. Occasional encounters took place between the people of Central Germany and the legions who guarded the well-protected Roman boundary-line, which extended from the Rhine to the Taunus, and from thence to the Danube; and from time to time the Batavii and other warlike tribes of the north and north-west, who, like them, had been brought into partial dependence on the Romans, rose in formidable insurrection; but after Trajan had restored order and strengthened the forts, peace remained undisturbed in the north till the beginning of the 3d c., while, with the exception of the sanguinary war of the Marcomanni and Quadi under Aurelius Antoninus in the year 166 A.D., there was a similar absence of hostilities in the south. But with the 3d c. the tide of war turned, and the Romans were now compelled to defend their own empire from the inroads of the numerous Germanic tribes, foremost among whom stood the powerful confederacies of the Alemanni and Franks. In their track followed, during the next two centuries, successive hordes of the Vandals, Suevi, Heruli, Goths, and Longobards, who soon formed for themselves states and principalities on the ruins of the old Roman provinces. From this period till the establishment of the western empire in the person of Charlemagne, the history of Germany is a blank; but the condition of the country when he entered on the possession of his German patrimony, shewed that since the retirement of the Romans the lesser tribes had become gradually absorbed in the larger, for on his accession the land was held by a few great nations only, as the Saxons, Frisians, Franks, Suabians, and Bavarians, whose leaders exercised sovereign power within their own territories, and in return for military services, parcelled out their lands to their followers.

The knowledge which we possess of the habits and government of the ancient Germans is principally derived from the Commentaries of Cæsar, and the 'Germania' of Tacitus; and imperfect as these sources of information are, they are infinitely less contradictory than the subsequent records of the earliest Christian times. According to the Roman historians, the Germans were a people of high stature, fair complexion, and red or yellow hair, endowed with great bodily strength, and distinguished for an indomitable love of liberty. The men delighted in active exercises and the perils of war, and the women, whose chastity was without reproach, were held in high esteem. Each master of a family had absolute power over those of his household. Their habitations were generally separate, and surrounded by their several stalls and garners; for although there were villages whose inhabitants made common use of the fields and woods surrounding them, the Germans seem to have preferred isolated and detached dwellings to aggregate settlements. Towns and cities they long regarded with aversion, as inimical to personal freedom. In regard to their political organisation, it would appear that several villages formed a 'hundred,' several hundreds one 'gau,' and several gaus one tribe. In each tribe the people were divided into four classes—nobles, freemen, freedmen or vassals, and slaves. The king or chief was elected from among the nobles; but his power was very limited, and the government of the several tribes seems to have been democratic rather than monarchical.

The religion of the Germans, which is shrouded in great obscurity, points, like their language, to their eastern origin, and was based upon Asiatic myths of the creation of the world, and the existence of gods having the forms and attributes of a perfect humanity. Their conceptions of these mythical beings were modified by the local colouring which they received from association with new scenes, and through the lapse of time; and hence the different tribes had all their special gods or demigods, who were often their own leaders or chiefs, to whom the attributes of the god to whose worship they were most partial were ascribed. It is generally said that the Germans had neither temples nor statues. Both Cæsar and Tacitus expressly affirm this, but it cannot be regarded as literally true, for Tacitus himself mentions a temple of a goddess Tanfana among the Marsians; and at a later period, we find Christian missionaries exhorting the Germans to change their pagan temples into Christian churches, while we also read of the destruction of pagan idols. Nevertheless, the religion of the Germans was mainly carried on in the open air—in groves and forests, and on heaths and mountains. Although a priestly order also existed among the Germans, yet each master of a household performed religious services for himself and his family within his own homestead. A knowledge of the will of the gods and the events of the future was sought by divination from observations of the flight of birds, the rushing of waters, and other similar signs, in the interpretation of which women were thought to be especially skilled. Belief in a future life, and in an abode after death for those who had deserved well in this life, was cherished among the Germanic races, who had a strong faith in retributive justice, whose sway they believed would be extended over the gods by involving them in a universal annihilating conflict as the punishment of their evil deeds, after which a new world was to arise guarded by a pure and perfect race of gods. In addition to the higher deities, the Germans peopled every portion of space with a class of subordinate beings who pervaded the earth, air, and water, in the shape of elves, nixes, kobolds, dwarfs, and giants; while Nornes and Valkuries stood apart from either grade of spiritual existence as the representatives of destiny like the Moiræ and Parcæ of the Greeks and Romans.—See Kuhn, *Zur ältesten Gesch. d. indogerman. Völker* (Berlin, 1850); Wackernagel, *Familienleben d. Germanen* (Freibr. 1846); Gibbon's *Decline and Fall of the Roman Empire;* Grimm, *Deutsche Mythologie*

(1844); Müller, *Gesch. und System d. altdeutsch. Religion* (1844).

GERMA'NICUS CÆSAR, a distinguished Roman general, belonging to the imperial family, was the son of Nero Claudius Drusus, and of Antonia, daughter of Mark Antony, and niece of Augustus. He was born 15 B.C., in the month of September. In accordance with the desire of Augustus, who had even thought of making him his successor, he was adopted in the year 4 A.D. by Tiberius, whom he accompanied in the war waged against the Pannonians and Dalmatians, for the purpose of securing the German frontiers after the defeat of Varus. After having been consul in 12 A.D., he was appointed in the following year to the command of the eight legions on the Rhine. On the death of Augustus, in 14 A.D., the soldiers revolted, demanding higher pay, and a shorter period of service. G. hastened from Gaul (where he happened to be at the time) to remind them of their duty. The soldiers, who almost idolised him for his frank and generous disposition, urged him to seize upon the supreme power. G., however, was incapable of treachery, and declared that he would rather die than forfeit his allegiance. He, however, granted their demands, though his colleague, A. Cæcina, secretly massacred the ringleaders at night. G. now led the legions over the Rhine below Wesel, attacked the Marsi during a nocturnal festival, and destroyed their celebrated temple of Tanfana. In 15 A.D., he made a second inroad into Germany. Proceeding from Metz into the country of the Catti, he destroyed their chief town of Mattium (Maden, near Gudensberg), slaughtering the entire inhabitants, young and old. On his return, his assistance was implored by the ambassadors of Segestes (always a firm ally of the Romans), who was besieged by his son-in-law, Arminius, the conqueror of Varus. This was at once given, and Thusnelda, the heroic wife of Arminius, fell into the hands of the Roman general. Arminius, burning with anger and shame, now roused the Cherusci and all the neighbouring tribes to war. G., in consequence, commenced a third campaign. He divided his army into three divisions. The main body of the infantry were led by Cæcina through the country of the Bructeri, the cavalry under another general marched through Friesland, while G. himself sailed with a fleet through the Zuydersee into the German Ocean, and proceeded up the river Ems, where he joined the others. The united divisions now laid waste the country in the neighbourhood of the Teutoburg forest, penetrated into its gloomy depths, and gathering up the bones of Varus and his legions, which had lain bleaching there for six long years, buried them with solemn funeral honours. A victory gained by Arminius induced G. to make a hasty retreat, during which he lost part of his fleet in a tempest. Cæcina, who retreated by land, sustained severe losses at the hands of the pursuing Germans. Before the fleet of 1000 vessels, which G. had built in Batavia, was equipped, he was recalled over the Rhine in 16 A.D. by news of the beleaguerment of the recently acquired fortress of Aliso, on the Lippe. The Germans were repulsed, and the funeral mound in the forest of Teutoburg, which they had thrown down, was again erected. G. now sailed with his fleet again into the Ems, pressed forward to the Weser, which he crossed, and completely overthrew Arminius in two battles. Nevertheless, he determined to return, and on his way, again lost the greater part of his fleet in a great storm. In order to prevent this event from giving courage to the Germans, he once more, in the same year, marched into the country of the Marsi, and despatched his lieutenant, Silius, against the Catti. The victories thus achieved were to have been followed up in the succeeding years, but Tiberius, jealous of his glory, recalled him, and feigning good-will, bestowed upon him the honour of a triumph, in which Thusnelda appeared among the captives. To rid himself of G., whose popularity seemed to render him dangerous, Tiberius sent him, in 17 A.D., with extensive authority, to settle affairs in the East, at the same time appointing Piso viceroy of Syria, whose haughty and despotic character everywhere counteracted the influence of Germanicus. G. died at Epidaphnæ, near Antioch, 9th October, 19 A.D., probably of poison. He was deeply lamented both by the inhabitants of the provinces and the citizens of Rome, whither his ashes were conveyed, and deposited by his wife Agrippina in the mausoleum of Augustus. Agrippina herself and two of her sons were put to death, by order of Tiberius; her third son, Caligula, was spared. Of the three daughters who survived their father, Agrippina became as remarkable for her vices as her mother had been for her virtues. Besides his splendid generalship, G. was conspicuous for his magnanimity, benevolence, finely cultured understanding, and personal purity of life. He wrote several works of a rhetorical character, which have been lost; but of his poetical works, we possess an epigram, a version of the *Phænomena* of Aratus, and fragments of a work of the same character, entitled *Diosemeia*, or *Prognostica*, compiled from Greek sources. G.'s literary remains were first published at Bologna, in 1474. The latest edition is that of Orelli, at the end of his Phædrus (Zurich, 1831).

GERMA'NO, SAN, a beautiful and prosperous town of Italy, is situated at the base of Monte Casino, in the province of Terra di Lavoro, about 50 miles north-north-west of Naples. It contains handsome public edifices, and is surrounded by the remains of monuments and buildings of high antiquarian interest; it is built on the site and from the ruins of the ancient Volscian town, Casinum, or Casca. The principal ruins of the ancient Volscian period are a monument, supposed to have been a tomb, an amphitheatre, and a temple. The first is now employed as a church; it is a square building, in the form of a Greek cross, constructed with enormous squared blocks of stone, on the Cyclopean principle. From its form, it is called the Church of the Crucifix, or *Crocefisso*. The second must have been a magnificent building, and it is still in a state of preservation sufficient to convey an idea of its original vast proportions. The third, adjoining the amphitheatre, was probably built in conjunction with it, at the cost of the Volscian matron, Umidia Quadratilla, mentioned by Pliny. The Benedictine monastery of Monte Casino, at a couple of miles' distance from San G., is one of the most renowned religious communities of Europe. Its foundation by St Benedict dates from 529. It contains one of the most beautiful churches of Italy, an extensive library, and a collection of the most precious documents of the middle ages in its valuable archives. The district surrounding San G. is highly cultivated, and beautiful. Pop. about 8000.

GERMANS, ST, formerly the seat of the Episcopal government of the ancient diocese of Cornwall, England, now a small village in the county of Cornwall. It stands on the slope of a hill, on a branch of the river Lynher, 10 miles above Plymouth Sound, and 21 miles east-south-east of Bodmin. It is notable only for its fine parish church, which has an excellent Norman west front, and the towers of which are hung with ivy and fern. Pop. (1861) 2827.

GE'RMANTOWN, formerly a post-borough of North America, in the state of Pennsylvania, about

6 miles north-north-west of Philadelphia, within the chartered limits of which city it was included in 1854. See article PHILADELPHIA.

GERMANY,* from Lat. *Germania* (q. v.), is the English name of the country which the natives call Deutschland, and the French L'Allemagne. See ALEMANNI. It occupies the central portions of Europe, and extends from 6° 20′ to 20° 10′ E. long., and from 45° 5′ to 54° 52′ N. lat. It is bounded on the N. by the German Ocean, the Danish Peninsula, and the Baltic; on the E. by the extra-Germanic provinces of Prussia and Austria (viz., Prussia Proper and Posen, Galicia, Hungary, and Croatia), and by Russian Poland; on the S. by the Adriatic Sea, Italy, and Switzerland; and on the W. by France, Belgium, and the Netherlands. The population of Germany Proper is about 45,000,000. Its area is estimated at 280,000 square miles, or about $\frac{1}{10}$th of that of all Europe. The coast-line measures about 730 miles, and the entire boundary-line about 2700 miles. G. is composed of an aggregation of different states (35 in number), which, as they are specially treated of under their respective heads, will only be noticed in the present article in as far as they severally form parts of the German Confederation.

The following list gives the names of these confederated states, with the amount of the contingent of men which each is bound to furnish (in accordance with the rate of its population) to the federal army. The populations and areas of the states will be found under *Europe* generally, and under the head of each specially.

	Main and Reserve Contingent.
Empire of Austria, in Germany Proper,	158,037
Kingdom of Prussia, exclusive of Prussia Proper and Posen,	133,769
Kingdom of Bavaria,	59,334
〃 〃 Saxony,	20,000
〃 〃 Hanover,	21,757
〃 〃 Würtemberg,	23,259
Grand Duchy of Baden,	16,667
Electorate of Hesse,	9,466
Grand Duchy of Hesse,	10,325
〃 〃 Mecklenburg-Schwerin,	5,967
〃 〃 Mecklenburg-Strelitz,	1,197
〃 〃 Oldenburg,	3,740
〃 〃 Luxemburg and Limburg,	2,706
〃 〃 Saxe-Weimar-Eisenach,	3,350
Duchy of Nassau,	6,109
〃 〃 Brunswick,	3,493
〃 〃 Holstein-Lauenburg,	6,000
〃 〃 Saxe-Meiningen,	1,918
〃 〃 Saxe-Coburg-Gotha,	1,860
〃 〃 Saxe-Altenburg,	1,638
〃 〃 Anhalt-Dessau-Köthen,	1,422
〃 〃 Anhalt-Bernburg,	616
Principality of Schwarzburg-Rudolstadt,	899
〃 〃 Schwarzburg-Sondershausen,	751
〃 〃 Lippe-Detmold,	1,202
〃 〃 Schaumburg-Lippe,	350
〃 〃 Reuss (Old Line),	371
〃 〃 Reuss (Younger Line),	870
〃 〃 Waldeck,	866
〃 〃 Liechtenstein,	91
Landgraviate of Hesse,	[illegible]
Free City of Frankfurt-on-the-Maine,	1,119
〃 〃 Hamburg,	2,163
〃 〃 Bremen,	749
〃 〃 Lubeck,	680

Besides the above political divisions, there are certain distinctive appellations applied to different parts of G., which have been derived either from the names and settlements of the ancient Germanic tribes, or from the circles and other great subdivision of the old empire. Thus the name of 'Swabia' is still applied in common parlance to the districts embracing the greater part of Würtemberg, Southern Baden, South-western Bavaria, and Hohenzollern; 'Franconia,' to the Maine districts of Bamberg, Schweinfurt, and Würzburg; 'the Palatinate,' to Rhenish Bavaria and the north of Baden; 'the Rhineland,' to portions of Baden, Prussia, Bavaria, Hesse-Darmstadt, and Nassau; 'Voigtland,' to the high ground between Hof and Plauen; 'Thuringia,' to the districts lying between the Upper Saale and the Werra, as Saxe-Weimar, &c.; 'Lusatia,' to the eastern part of Saxony; 'East Friesland,' to the country between the Lower Weser and Ems; and 'Westphalia,' to the district extending between Lower Saxony, the Netherlands, Thuringia, and Hesse, to the German Ocean.

Four-fifths of the population of this country are of the race called in English Germans, in French Allemands, but by the people themselves Deutsche. The term Deutsch, in Gothic *thiudisk*, in O. H. Ger. *diutisc* (Latinised into *theotiscus*), is derived from the Gothic substantive *thiuda*, people, and therefore meant originally the popular language, or, in the mouth of the learned, the vulgar tongue. In the 12th and 13th centuries it became elevated into the accepted designation both of this widespread tongue and of the race that speak it.

The whole population of the German Federal States amounted, at the close of 1857, as shewn by the census of that year, to upwards of 44,000,000. The most densely peopled districts were those about the cities of Trieste and Frankfurt-on-the-Maine, while the most sparsely peopled were those of Salzburg and the Tyrol and Carinthia generally. When considered in regard to origin, the population of G. may be divided as follows: Germans, 36,000,000; Slavonians, 7,343,000; Romanians, 530,000; Greeks and Armenians, 6000; Jews, 500,000. The Germans admit of being divided into High and Low Germans; the phraseology of the former is the cultivated language of all the German states, that of the latter, known as *Platt Deutsch*, is spoken in the north and north-west. The Slavonians are found chiefly in Austria, Prussia, and Saxony, and admit of being divided into a northern and southern branch. To the former belong the 'Czechs' of Bohemia, Moravia, and Silesia, the 'Wends' of Prussian Lusatia, the 'Water Polacks' of Silesia, and the 'Kassubes' of Pomerania; while to the latter branch belong the 'Slovenes' of Carinthia, the 'Croats' of Lower Austria and Moravia, and the 'Serbians' of Istria. The Romanic races comprise the Italians of Southern Tyrol, the Walloons and French in the Rhenish and Bavarian districts, the Ladines of the Tyrol, the Furlani of Görz, and the Ostromanians of Carinthia and of the littoral districts of the south. Although the Jews are scattered over every part of Germany, they are most numerous in the Austrian and Prussian territories; while the few thousand gipsies settled on the German continent are almost exclusively limited to the south-eastern districts.

Physical Character.—G. may be regarded as presenting three distinct terrace-like formations—viz., 1. An alpine region in Southern Germany; 2. A range of high table-land which occupies the central portions of the continent; and 3. A vast sandy plain, which extends from the middle terrace to the German Ocean. The alpine region may be considered as lying south of a line drawn from Vienna to Bregenz, and embraces an area of about 42,000 square miles, covered with alpine heights and valleys. The central portion of G. as far north as a line drawn from Oderberg to Rheina on the Ems, having an area of about 105,000 square miles, consists of numerous ranges and groups of mountains (the Sudetic chain, Erzgebirge, Böhmerwald, Schwartzwald, Fichtelgebirge, Taunus, Hartz, &c.), and of table-lands and plains of greater or less elevation (e. g., the plateau of Bavaria between the Iller and the Inn, having a mean elevation of 1580 feet; the mountainous table-land of the Rauhe Alp (see **Alp**) in Wurtemberg, &c.). The great plain of Northern G. extends from the Russian frontier to the Netherlands and Belgium, and has an area of about 94,500 square miles. The general low level of this plain is varied by two terrace-like elevations. The one stretches from the Vistula into Mecklenburg, at no great distance from the coast of the Baltic, and has a mean elevation of 500 to 600 feet, rising in one point near Danzig to 1020 feet; the other line of elevations begins in Silesia and terminates in the moorlands of Lüneburg, in Hanover, its course being marked by several summits from 500 to 800 feet in height. A large portion of the plain is occupied by sandy tracts interspersed with deposits of peat; but other parts are moderately fertile, and admit of successful cultivation.

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* For latest information, see SUPPLEMENT, vol. x.

In respect of drainage, the surface of G. belongs to four different basins. The Adige, and other streams of Southern Tyrol, carry the waters of 8000 square miles of G. into the Adriatic. The Danube (q. v.) from its source in the Schwartzwald to the borders of Hungary belongs to G., and through this channel the waters of 72,000 square miles are poured into the Black Sea; thus opening up communication with the east. The remaining part (two-thirds) of the surface has a northern slope, and belongs partly (122,000 square miles) to the basin of the North Sea, and partly (38,600 square miles) to the Baltic. The chief German streams flowing into the North Sea are the Rhine (q. v.), the Weser (q. v.), and the Elbe (q. v.); into the Baltic, the Oder (q. v.) and the Vistula (q. v.).

The most important of the numerous canals which connect together the great river systems of G. are Ludwig's Canal in Bavaria, which unites the Danube and Maine, and thus opens a communication between the Black Sea and German Ocean; the Wiener-Neustadt Canal in Lower Austria; the Finow and Friedrich-Wilhelm's canals in Brandenburg; the Kiel and Eyder Canal, uniting the Baltic and German Ocean; and the Plaue Canal, which connects the Elbe and the Havel. Numerous lakes occur both in the elevated plains of Southern G. and in the low lands of the northern districts, but few of them are of any great size. The most important are the Boden-See (Lake of Constance) (q. v.); the Lake of Garda (q. v.), which, however, belongs only partially to G.; and the numerous smaller lakes which occur in the alpine districts of the Austrian provinces, and whose waters are dependent upon the mountain cascades. G. abounds in swamps and marsh-lands, which are especially numerous in the low northern districts and on the elevated plains of Moravia and Bavaria. Its mineral springs, of which there are probably nearly a thousand, occur principally in Bohemia, Nassau, Würtemberg, Baden, and Bavaria. Many of these springs have retained their high reputation from the earliest ages.

Geology.—The Alps are raised by the intrusion of granitic rocks through Tertiary strata of the age of the Paris basin, which are elevated, often in a highly altered condition, on the sides of the mountains. These Tertiary strata continue northwards as far as the course of the Danube, covering the whole country from Berne to Vienna. The great plain of North Germany consists of strata of the same age, covered with very recent sand and mud. Newer Tertiary beds occupy the river basin of the Rhine north from Mayence; they consist of fine light-coloured loam, and contain the bones of the mammoth, rhinoceros, and other contemporaneous mammals. Erratics are scattered over the north of Germany. The whole district in the centre of Germany, from the Danube northwards to Hanover, consists of Secondary strata. The rocks of the Trias period are best known in Germany, the typical rocks of bunter sandstein, muschel-kalk, and keuper being developed here, so as to justify the suitableness of the name Trias, which is wholly inapplicable in Britain, where the series is represented by sandstone beds only. In Southern Germany the strata of this age are rich in mines of rock-salt. The Trias is highly fossiliferous, abounding especially in marine shells, and containing several genera of remarkable labyrinthodont saurians. Jurassic rocks occur in Central Germany; at Hanover they consist of clays and marl, with beds of sandstone and limestone, containing coal and ironstone of such value that they have been extensively wrought. The Cretaceous strata are frequently highly altered from the intruded igneous rocks, which have raised the beds in some districts to a nearly vertical position, and have altered them into crystalline marbles and silicious sandstones.

Of the Palæozoic rocks, the carboniferous strata are nearly absent in Germany. The coal obtained in the country is from rocks of a later age. True coal-beds are found in Rhenish Prussia. The sedimentary rocks of the Harz Mountains are chiefly Devonian; to the south-east, near Herzgerode, they are Upper Silurian. They are all greatly dislocated by granite and other intrusive rocks. The Harz Mountains are surrounded by a zone of Permian rocks. The stratified rocks of the Thuringerwald are also Devonian, resting on Lower Silurian strata, the lower portion of which is highly altered into quartzose schists; the remainder consists of greywacke, slate, and sandstone, with limestone and alum slates. There are numerous fucoid and annelid impressions in the older beds, and graptolites, orthoceratites, and trilobites in the newer.

The granitic rocks appear in the Alps, the Riesengebirge, and Erzgebirge. The basalts, trachytes, and other volcanic products are largely developed in the Eifel, Siebengebirge, Westerwald, Vogels, Rhön-gebirge, and other mountain systems.

Climate.—The climate of G. presents less diversity than a first glance at the map might lead one to infer, for the greater heats of the more southern latitudes are considerably modified by the alpine character of the country in those parallels, while the cold of the northern plains is mitigated by their vicinity to the ocean. The average decrease in the mean temperature is in going from south to north, about 1° F. for every 52 miles; and in going from west to east, about 1° F. for every 72 miles. The line of perpetual snow varies from 7200 to 8000 feet above the level of the sea. The mean annual fall of rain is 20 inches; the maximum, which is met with on the southern slope of the Alps, being 28 inches. The following table shews the mean annual records of the temperature at different points of the continent:

	Mean An. Temp.	Summer.	Winter.
Trieste, ...	55·° Fah.	72° Fah.	38° Fah.
Vienna, ...	49·5	70	29
Hamburg, ...	47·	64	30
Dresden, ...	48·	67	29
Frankfort-on-the-Maine,	48·5	66	31
Berlin, ...	46·5	66	27
Hanover, ...	48·	63	33
Königsberg, . . .	43·	62	24

Products.—G. is rich in mineral products, among which the most important are silver, found in the Harz Mountains; quicksilver, lead, copper, and tin in the Austrian provinces especially; iron in numerous mountain-ranges; salt in many parts of the country; coal in Rhenish Prussia, Silesia, Bohemia, and Styria. Cobalt, arsenic, sulphur, saltpetre, alum, gypsum, bismuth, pumice-stone, tripoli-slate, kaolin, emery, ochre, and vitriol, are all among the exports of Germany. The vegetable products comprise a very large proportion of the European flora. All the ordinary cereals are extensively cultivated in the north, and largely exported, chiefly from Würtemberg, Bavaria, and Moravia; hemp and flax, madder, woad, and saffron, grow well in the central districts, where the vine, the cultivation of which extends in suitable localities as far north as 51°, is brought to great perfection—the best wine-producing districts being the valleys of the Danube, Rhine, Maine, Neckar, and Moselle, which are, moreover, generally noted for the excellence of their fruits and vegetables. Tobacco is grown in sufficient quantities for extensive exportation on the Upper Rhine, the Werra, and Oder. The hops of Bohemia and Bavaria have a high reputation, and the chicory grown in those countries, and in the district between the Elbe and Weser, finds its way all over Europe as a substitute for coffee. The most extensive forests are found in Central and Southern G., and in some parts of Prussia, while the north-western parts of the great plain are deficient in wood, the place of which is in some degree supplied by the abundance of turf yielded by the marshy lands. G. has long been noted for the good breed of horses raised in the northern parts of the continent, while Saxony, Silesia, and Brandenburg have an equal reputation for their sheep-flocks, and the fine quality of the wool which they yield. The rich alluvial flats of Mecklenburg and Hanover are celebrated for their cattle; the forests of Northern and Central G. abound in swine, and in small game of various kinds; while the Bavarian and Austrian Alps afford shelter to the larger animals, as the chamois, the red deer and wild-goat, the fox, marten, and wolf, and even in some parts to the bear and lynx. The eagle, vulture, and other birds of prey are met with in these alpine regions; and in all the plains in the north, storks, wild-geese, and ducks are abundant. Among the fishes of G., the most generally distributed are carp, salmon, trout, and eels; the rivers contain also cray-fish, pearl-bearing mussels, and leeches. The oyster, herring, and cod fisheries, constitute important branches of industry on the German shores of the Baltic and North Sea. G. stands next to Great Britain in regard to the care and success with which its agricultural, mining, and other natural capabilities have been cultivated. All the German states encourage agriculture, and have endeavoured, by the establishment of agricultural colleges and exhibitions, to diffuse among the people a knowledge of recent scientific appliances. The countries which have become most conspicuous in this movement are Lower Austria, Moravia, Silesia, Bohemia, Bavaria, and Saxony. The preservation and cultivation of woods receive almost as much attention in G. as agriculture, and like the latter, are elevated to the rank of a science. The larger woods and forests in most of the states belong to the government, and are under the care of special boards of management, which exercise the right of supervision and control over all forest lands, whether public or private.

The following table shews, approximately, the relative modes of distribution of the country into arable, meadow, and other lands, heaths, &c., reckoning the Prussian *morgen* = ·63 of an acre:

	Acres.
Arable land,	60,742,710
Meadow land,	16,152,570
Gardens, orchards, &c.,	1,779,120
Vineyards,	691,929
Woods, forests,	40,306,140
Heaths, moors, roads, buildings, &c.,	28,872,068
	148,544,537

Manufactures.—The oldest and most important of the German industrial arts are the manufactures of linen and woollen goods. The chief localities for the cultivation and preparation of flax, and the weaving of linen fabrics, are the mountain-valleys of Silesia, Northern Bohemia, Moravia, Lusatia, Westphalia, the Harz, and Saxony (for thread-laces); while cotton fabrics are principally made in Rhenish Prussia, Saxony, Moravia, and Lower Austria. The same districts, together with Pomerania, the Tyrol, and Bavaria, manufacture the choicest woollen fabrics, including damasks and carpets. Toys, wooden clocks, and wood-carvings, which may be regarded as almost a speciality of German industry, are carried to the greatest perfection in the hilly districts of Saxony, Bavaria, the Black Forest, and the Tyrol. The best iron and steel manufactures belong to the Austrian provinces, Silesia, Hanover, and Saxony. Bohemia and Silesia probably possess the finest glass-manufactories; while Saxony, Prussia, and Austria stand pre-eminent for the excellence of their china and earthen wares. Prague, Augsburg, and Nürnberg dispute with Vienna, Munich, and Berlin the title to pre-eminence in silver, gold, and jewellery work, and in the manufacture of philosophical and musical instruments; while Leipsic, together with Vienna and Munich, claims the first rank for its type-foundries, printing, and lithography. The trading cities of Northern G. nearly monopolise the entire business connected with the preparation of tobacco, snuff, &c., the distillation of brandies, and the manufacture of sugar from the beet, potato, and other roots; while vinegar and oils are prepared almost exclusively in Central and Southern Germany.

Exports and Imports.—The chief exports of G. are linen, woollen-cloth, wool, grain, seeds yielding oil, wooden goods, toys, glass and earthen-ware, leather, horn, bristles, honey, wax, wine, spirit, zinc, cobalt, gypsum, potash, vitriol, copper, brass, iron, and steel ware. The principal imports are raw cotton and silk, the ordinary articles of colonial produce, as sugar, rice, &c., tea, spices, furs, pitch, train-oil, dried fish, &c. According to Dr Hübner, the value of the imports and exports which passed the German customs between 1850 and 1855 exhibits the following rates of increase, given in German thalers:

Year.	Imports. Thalers.	Exports. Thalers.	Transit. Thalers.	Sum total. Thalers.
1850,	181,659,164	172,948,116	78,224,420	432,831,700
1853,	203,931,989	251,380,676	105,509,459	560,822,124
1855,	315,764,875	308,587,411	167,036,000	791,388,286

While, according to Dr Brachelli's *Statistiche Tabeln* for 1862, the imports of the Zollverein for 1861 were 312½ million thalers, and the exports 350⅞ million thalers. The principal German ports are Hamburg and Bremen, for American and British commerce; Trieste, for the Mediterranean and Oriental trade; Altona, Lübeck, Stettin, and Stralsund, for general trade. The chief emporiums for inland commerce are Augsburg and Botzen, for Italy; Augsburg, Constance, and Memmingen, for Switzerland; Frankfurt-on-the-Maine and Mayence, for France; Aix-la-Chapelle and Cologne, Leipsic and Frankfurt-on-the-Oder, for Russia. The home-trade is principally effected in the south-east by Vienna; in the south-west, by Augsburg; in the north-west, by Frankfurt-on-the-Maine; and in the north-east, by Leipsic; while Berlin, Cologne, Nürnberg, Prague, Breslau, Mayence, and Frankfurt-on-the-Oder, are all important centres of the general home-trade. The great periodic fairs, which are still held in different cities, as at both the Frankfurts, Brunswick, Stuttgart, Leipsic, &c., constitute no unimportant adjuncts to the commerce of Germany. The book-fairs held at the two last-named cities—the only ones of their kind in Europe—may be regarded as the two great centres of the German book-trade, Leipsic supplying the north, and Stuttgart the south of the continent. The maritime trade of G. has of late years attained very great importance. There were in 1858, according to Dr Brachelli, about 5000 German sea-going vessels (exclusive of about 900 or 1000 steam and sailing coast and river boats); while about 100,000 vessels yearly enter the German ports.

The railways, which intersect each other in all directions from Trieste to Hamburg, and from Vienna to Aix-la-Chapelle, measure, in 1862, nearly 1800 German, or about 7250 English miles; while according to Brachelli, the high-roads of G. extended over a length of 27,000 German miles. The postal system of the German states, which is administered by 18 Boards of Control, includes the expedition of passengers and goods by the post-carriages of the several departments. Since 1851, in accordance with a treaty concluded between Austria and Prussia, a Germano-Austrian postal confederation has been established, the objects of which are to secure an effective and more energetic administration of the various branches of the organisation, and the adoption of a uniform scale of charges, while it likewise exercises the duty of concluding international postal treaties with foreign states. A similar confederation, representing all the principal German states, controls the administration of the telegraphic lines, which measure nearly 5000 German miles.

The multiplicity of small states, into which the German land is broken up, has opposed great obstacles to the development of commerce; but the difficulty has to some extent been obviated by the establishment of the *Zoll und Handels-verein* (q. v.), or 'Customs and Trade Confederation.'

Education.—Education is more generally diffused in G. than in any other country of Europe, and is cultivated with an earnest and systematic devotion not met with, to an equal extent, among other nations. There are 24 universities: Vienna, Prague, Grätz, Innspruck, Berlin, Breslau, Halle, Bonn, Greifswald, Olmütz, Munich, Würzburg, Erlangen, Leipsic, Tübingen, Göttingen, Heidelberg, Freiburg, Marburg, Giessen, Jena, Rostock, Kiel, and Königsberg. These institutions embrace the four faculties of theology, law, medicine, and philosophy, and have between 1700 and 1800 professors, and on an average about 14,000 students. There are also 16 polytechnic institutions; upwards of 500 high schools or gymnasia; numerous special schools of technology, agriculture, commerce, military science, &c.; several seminaries for teachers, and for the ministers of different religious denominations; and 62,000 free national schools. The attendance of children at school, for at least four or five years, is made compulsory in nearly all the German states, and hence the proportion of persons who cannot read and write is exceedingly small in Germany.

Public libraries—of which there are more than 150—museums, botanical gardens, art-collections, picture-galleries, schools of music and design, and academies of arts and sciences, are to be met with in most of the capitals, and in many of the country towns, upwards of 200 of which possess one or more permanently established theatres. In no country is the book and publishing trade more universally patronised than in Germany. The press annually sends forth from 8000 to 10,000 works, while about 3000 papers and journals are circulated throughout the confederate states; of the current newspapers, a comparatively small number only exert any marked influence, but many of the German scientific and literary periodicals enjoy a worldwide reputation. The censorship of the press was abolished by a decree of the diet of 1848, and freedom of the press, under certain restrictions, which were promulgated in 1854, has been introduced in all the confederate states.

Religion.—In regard to religion, it may be stated generally that Protestantism predominates in the north, and Roman Catholicism in the south, although very few states belong exclusively to either form of faith.

The following is the proportion of the different denominations, as given by Dr Brachelli: Roman Catholics, 22,300,000; Lutherans, 10,200,000; Calvinists (Evangelical), 9,300,000; Calvinists (Reformed), 900,000; various Christian sects, as Herrenhuters, Mennonites, &c., 50,000; Greek and Armenian Church, 5000; Jews, 500,000.

Political Organisation.—All the states of the Confederation recognise four distinct orders—viz., the nobility, clergy, burghers, and peasantry, and all distinguish three distinct grades of nobility. The highest of these includes the members of reigning houses, and the descendants of families who belonged at the time of the old empire to the sovereign nobility of the state, and were *reichsunmittelbar*, or directly connected with the empire, as holding their domains directly under the emperor, but whose houses have subsequently been *mediatised*, or deprived of sovereign power in accordance with special treaties between the state and the princes. There are at present 50 princely and 51 *gräfliche* (countly) mediatised families, who, in accordance with the act of the diet of 1806, have equality of rank with reigning houses, and enjoy many of the special privileges which were accorded to the high nobles of the empire. The second grade of nobility is composed of counts and barons not belonging to reigning or mediatised houses, whilst the third and lowest grade includes the knights and hereditary patrimonial proprietors of Germany.

Before we proceed to consider the political organisation of the existing Confederation, we will briefly describe the principal features of the constitution of the old German empire, on which the present system of the federal government has been based. (The origin of the empire is described in the historical sketch below.) The states of the empire consisted of three chambers or colleges. 1. The Electoral College, which consisted of the archiepiscopal electors of Mainz, Treves, and Cologne; and the secular electors, of which there were originally only four, but whose number was subsequently increased to five, and who at the dissolution of the empire were represented by the sovereigns of Bohemia, Bavaria, Saxony, Brandenburg, and Brunswick-Lüneburg or Hanover (see ELECTORS). 2. The College of the Princes of the Empire, who had each a vote in the diet, and were divided into spiritual and temporal princes. 3. The Free Imperial Cities which formed a college at the diet, divided into two benches, the Rhenish with 14 cities, and the Swabian with 37; each of which had a vote. These colleges, each of which voted separately, formed the diet of the empire. When their respective decisions agreed, the matter under discussion was submitted to the emperor, who could refuse his ratification of the decisions of the diet, although he had no power to modify them. Ordinary meetings were usually summoned twice a year by the emperor, who specified the place at which the sittings were to be held, and which, during the latter periods of the empire, were at Regensburg (Ratisbon). The diet had the right to enact, abrogate, or modify laws, conclude peace and declare war, and impose taxes for the general expenses of the state. The

Aulic Chamber, and the Cameral or chief tribunal of the empire, decided in cases of dispute between members of the diet. The emperors were elected by the electors in person or by their deputies; and after their election and coronation, which usually both took place at Frankfurt-on-the-Maine, the emperor swore to the 'capitulation' or constitution of the empire. The diet, after the dissolution of the empire in 1806, remained in abeyance till it was re-organised in 1814, after the disruption of the Confederation of the Rhine, which had owed its existence to Napoleon.

The existing Germanic Confederation was established by an act of the Congress of Vienna in 1814, and confirmed by a further act in 1821. It is an indissoluble union, from which no single state can at its own pleasure retire. Its central point and its executive and legislative powers are represented by the federative diet, which holds its meetings at Frankfurt-on-the-Maine, and is composed of delegates from all the confederate states, chosen not by the people, but by the various governments. The diet deliberates either in a limited council (the Federative Government) or as a general assembly (*Plenum*). In the limited council there are 17 votes, of which 11 of the principal states have each a single vote, while the remaining states divide the six collective votes between them. The Plenum, which meets only when any organic change is to be effected in the diet itself, embraces 70 votes, of which Austria and the five German kingdoms have each four, while the other states have 3, 2, or 1 vote each in proportion to their individual importance. It rests with the limited council, which executes the enactments of the Plenum, and despatches the ordinary business of the Confederation, to decide (by a majority of voices) whether a question shall be submitted to the Plenum, where it is not debated, but simply decided by a majority of ayes or noes. Austria presides in both assemblies, and has a casting voice in cases of equality. The diet, as a collective body, has the right of concluding peace and alliances, and declaring war; but this power can only be exercised for the maintenance of the independence and external security of G., and the individual integrity of the several federative states, which on their part are bound to submit to the diet the consideration of all questions in dispute between themselves and other powers. Where such differences cannot be settled by the committee empowered by the Plenum to consider them, they are finally referred to a special tribunal known as the 'Austrägal' Court, which is composed of several members of the Confederation invested for the time with full powers. The diet is bound to maintain the existing order of government in each state, and to aid the sovereign in suppressing any attempts by the subjects to subvert it. Those members of the Confederation whose territories do not contain a population of 300,000, must, in accordance with the rules of the diet, incorporate themselves with some other federative state for the establishment of a joint high court of appeal. When disputes arise between rulers and their subjects in regard to the questions of internal government, they must be submitted to the tribunal of the federative government, which is a body composed of 34 members, known as *Sprüchmänner*, who are elected triennally by the diet, and from among whom the disputing parties choose their respective umpires. The army of the Confederation, which is composed, as already stated, of the contingents furnished by the different states in proportion to their respective populations, amounts to nearly 563,000 men on a war-footing, and 503,000 on a peace-footing. More than half this number is supplied by the contingents of Austria and Prussia, on whose troops devolves the duty of garrisoning the fortress of Mayence, and (in conjunction with Bavarian troops) the city of Frankfurt-on-the-Maine, as the seat of the diet. The finances of the diet are under the control of a financial committee, which fixes the proportion to be paid into the common treasury by each state in accordance with the number of its inhabitants.

See *Handbuch d. Geog. und Statist.* v. Dr Wappäus (Leip. 1859); *Geogr.-Statist.-Hist.-Atlas der Staaten d. Deutsch. Bund* v. Weiland (1828); H. Berghaus, *Ethnograph.-Statist.-Darstellung des deutschen Reichs* (Gotha, 1848); Schauenburg, *Flusscharte v. Deutschl. und Mittel-Europa* (Berlin, 1855); Stieler's *Hand-Atlas* (Gotha, 1861); Von Klöden's *Erdkunde* (Berlin, 1861); Brachelli, *Deutsche Staatenkunde* (Wien, 1857), and his *Statistische Tabeln* (1862); C. Dieterici, *Statist. Uebers im deutsch. Zollver.* (Berl. 1857); Zachariä, *Die deutsch. Verfass. Gesetze der Gegenwart* (Göttingen, 1855); K. Bädeker's *Handbücher*, and the *Almanach de Gotha* (1862).

German History.—After the gradual expulsion or retirement of the Romans from Germany, the country necessarily became subdivided into numerous petty states, each governed by its own chief. The erection of the Franko-Merovingian empire in France had given preponderance to the Frankish power on both sides of the Rhine, and when Charlemagne succeeded in 771 to the German as well as the Gallic possessions of his father, Pepin d'Heristal, he found himself possessed of an amount of territory and a degree of influence which speedily enabled him to assert supremacy over the whole of the west of Germany, while his conquests over the heathen Saxons in the north, and the Avari who then held Pannonia in the south-east, extended his German dominions from the North Sea to the Alps, and from the Rhine as far as Hungary. With Charlemagne, who received the imperial crown at the hands of the pope in 800, began the long line of emperors and kings who occupied the German throne for more than a thousand years, and with him, too, the vast fabric, which he had reared on the ruins of Roman power, lost its stability, for at his death in 814, no member of his family was competent to wield the imperial sceptre, although in 843 some portions of his German possessions fell, in accordance with a family compact, to his grandson Ludwig, surnamed 'the German,' who was recognised as king of Germany. On the extinction, in 911, of the degenerate Carlovingian dynasty in the person of Ludwig 'the Child,' the provincial rulers, who, together with the archbishops, bishops, and abbots, constituted the chief members of the diet or national assembly, arrogated to themselves (in imitation of the practice of the nobles of the ancient German tribes) the right of electing their sovereign, who, however, could not assume the imperial title till he had been crowned by the pope. At this period, there were in Germany five nations—the Franks, Saxons, Bavarians, Swabians, and Lorrainers. The Franks, as the descendants of those who had conquered the land and founded the empire, enjoyed a pre-eminence over the others; and hence, on the extinction of the Carlovingian race, the choice of the prince-electors seems to have fallen almost as a matter of course on the chief of the Franks, the Duke or Count of Franconia, who reigned as king of Germany from 911 to 918, under the title of Conrad I. At his own instigation, his rival and adversary, Henry, Duke of Saxony, was chosen as his successor, and proved himself an able and warlike prince. The conquests which he gained over the Danes, Slaves, and Magyars were confirmed and extended by his son and successor, Otho I. (936—973), who carried the boundaries of the empire beyond the Elbe and Saale, and who, by his acquisition of Lombardy, laid the foundation of the relations which existed for many ages between the rulers of Germany and the Italian nation. Otho's coronation-festival was eventful, as it formed the precedent for the exercise of those offices which, till the dissolution of the empire, were regarded as connected with the dignity of the secular electors, for on that occasion, while the emperor dined with his three spiritual electors, he was waited upon by the secular princes—the Elector of Bavaria (afterwards Saxony) serving as grand-marshal; of Swabia (afterwards Bohemia), as grand-cupbearer; and of Lorraine (afterwards Brandenburg), as arch-chamberlain.

Otho II. (973—983), Otho III. (983—1002), and Henry II. (1002—1024), belonged to the House of Saxony, which was succeeded by that of Franconia, in the person of Conrad II. (1024—1039), an able ruler, who added Burgundy to the empire. His son and successor, Henry III. (1039—1056), extended German supremacy over Hungary, part of which he conquered and annexed to Lower Austria, while he repressed the insolence and despotism of the temporal and spiritual princes of Germany, and gained the respect of his contemporaries by his zeal for justice and his valour in the field. The minority of his son and successor, Henry IV. (1056—1106), enabled the nobles to recover much of their former power, and to apply a check to the further consolidation of the imperial authority, which had been considerably extended under the two preceding reigns. Henry's constant quarrels with the astute Gregory VII. entangled him in difficulties and mortifications which only ended with his life, and which plunged Germany into anarchy and disorder, and entailed upon the empire destructive wars which convulsed the whole of continental Europe for more than two centuries. With his son and successor, Henry V. (1106—1125), the male line of the Franconian dynasty became extinct; and after the crown had been worn (1125—1138) by Lothaire of Saxony, who made a bold attempt to recover some of the prerogatives of which at his election the empire had been deprived through papal intrigues, the choice of the electors, after a season of dissension and intrigue, fell upon Conrad III., Duke of Franconia, the first of the Hohenstauffen dynasty (1138—1152). His reign, in which the civil wars of the Guelphs and Ghibellines began, was distracted by the dissensions of the great feudatories of the empire, while the strength of Germany was wasted in the disastrous Crusades, in which Conrad took an active part. On his death, the electoral college for the first time met at Frankfurt, which retained the honour of being the place at which the sovereign was elected and crowned till the dissolution of the empire in the 19th century. Frederick I. (1152—1190), surnamed Barbarossa, Duke of Swabia, was, at the recommendation of his uncle Conrad, chosen as his successor, and the splendour of his reign fully warranted the selection. By the force of his character, Frederick acquired an influence over the diets which had not been possessed by any of his immediate predecessors, and during his reign many important changes were effected in the mutual relations of the great duchies and counties of Germany, while we now for the first time hear of the *hereditary* right possessed by certain princes to exercise the privilege of election. Unfortunately for Germany, this great monarch suffered the interests of his Italian dominions to draw him away from those of his own country, whilst his participation in the Crusades, in which both he and the flower of his chivalry perished, was only memorable for the misfortunes which it entailed on the empire. The interval between the death of Frederick Barbarossa (1190) and the accession of Rudolf I. (1273), the first of the Hapsburg line, which, through a female branch, still reigns in Austria, was one of constant struggle, internal dissension, and foreign wars. Individually, the princes of the Hohenstauffen dynasty were popular monarchs, their many noble and chivalrous qualities having endeared them to the people, while one of the race, Frederick II. (1212—1250), was, after Charlemagne, perhaps the most remarkable sovereign of the middle ages; but their ambitious designs on Italy, and their constant but futile attempts to destroy the papal power, were a source of misery to Germany, and with Frederick II. ended the glory of the empire, till it was partially revived by the Austrian House of Hapsburg. His son, Conrad IV. (1250—1254), after a brief and troubled reign, was succeeded by various princes, who, in turn, or in some cases contemporaneously, bore the imperial title without exercising its legitimate functions or authority. This season of anarchy was terminated at the accession of Rudolf I. (1273—1291), who, by the destruction of the strongholds of the nobles, and the stringent enforcement of the laws, restored order. His chief efforts were, however, directed to the aggrandisement of his Austrian possessions, which embraced Styria, Carinthia, Carniola, and Tyrol.

For the next 200 years, the history of the German empire presents very few features of interest, and may be briefly passed over. Adolf of Nassau, who was elected to succeed Rudolf, was compelled in 1298 to yield the crown to the son of the latter, Albrecht I. (1298—1308), whose reign is chiefly memorable as the period in which three Swiss cantons, Unterwalden, Schwytz, and Uri, established their independence. After the murder of Albrecht, the throne was occupied in rapid succession by Henry VII. (1308—1313), who added Bohemia to the empire; and conjointly by Frederick of Austria and Ludwig of Bavaria (1313—1349). Charles IV. (1349—1378) of Luxembourg was the successful candidate among many rivals, and although he attended specially to the interests of his hereditary possessions of Bohemia, Moravia, Silesia, and Lusatia, he did not entirely neglect those of the empire, for which he provided by a written compact, known as the *Golden Bull*, which regulated the rights, privileges, and duties of the electors, the mode of the election and coronation of the emperors, the coinage, customs, and commercial treaties of the empire, and the rights and obligations of the free cities. His son, Wenceslaus (1378—1400), who was finally deposed, brought the royal authority into contempt, from which it was scarcely redeemed by Ruprecht of the Palatinate (1400—1410). The nominal reign of Sigismund (1410—1437), the brother of Wenceslaus, would demand no notice were it not for his connection with the Councils of Constance and Basel, at the former of which Huss was condemned, and which was followed by the disastrous Hussite wars. The readiness with which Sigismund lent himself to the interests of Henry V. of England, and of all other princes who ministered to his love of personal display, brought discredit on the imperial dignity, while his dishonourable desertion of Huss will ever attach ignominy to his name. Albrecht II. of Austria (1438—1440), after a brief reign of two years, in which he gave evidence of great capacity for governing, was succeeded by his cousin, Frederick III. (1440—1493), an accomplished but avaricious and indolent prince, whose chief object seemed to be the aggrandisement of the House of Austria, with which the title of emperor had now become permanently connected (see AUSTRIA), while he neglected the interests of Germany collectively, and suffered the infidels to make unchecked advances upon its territory. Maximilian I. (1493—1519), the son and successor of Frederick, resembled him in few respects, for he was active, ambitious, and scheming, but deficient in steadiness of purpose. His marriage with Mary, the rich heiress of her father, Charles the Bold of Burgundy, involved him in the general politics of Europe, while his opposition to the reformed faith preached by Luther exasperated the religious differences which disturbed the close of his reign. Maximilian had, however, the merit of introducing many improvements in regard to the internal organisation of the state, by enforcing the better administration of the law, establishing a police and an organised army, and introducing a postal system. With him originated, moreover, the special courts of jurisdiction known as the 'Imperial Chamber' and the 'Aulic Council;' and in his reign, the empire was divided into ten circles, each under its hereditary president and its hereditary prince-convoker. Maximilian lived to see the beginning of the Reformation, and the success that attended Luther's preaching; but the firm establishment in Germany of the reformed faith, and the religious dissensions by which its success was attended, belong principally to the reign of his grandson, Charles I., king of Spain, the son of the Archduke Philip and of Joanna, the heiress of Spain, who succeeded to the empire under the title of Charles V. (1519—1556). The management of his vast possessions in Spain, Italy, and the Netherlands, and the wars with France, in which he was so long implicated, diverted him from his German territories, which he committed to the care of his brother Ferdinand. The princes of Germany were thus left to settle their religious differences among themselves, and to quell, unaided by the head of the state, the formidable insurrection of the peasants (1525), which threatened to undermine the very foundations of society. This rising of the lower orders was due to the preaching of the fanatic Münzer, and other leaders of the sect of Anabaptists, which had arisen from a perverted interpretation of some of the tenets advanced by Luther. Charles's determined opposition to the reformers rendered all settlement of these religious differences impracticable; and although, by the aid of his ally, Maurice of Saxony, he broke the confederation of the Protestant princes, known as the Union of Smalkald, he was forced by his former ally to make concessions to the Lutherans, of which he disapproved; and in his disgust at the complicated relations in which he was placed to both parties, he abdicated in favour of his brother Ferdinand (1556—1564), who put an end to much of the religious dissension that had hitherto distracted the empire, by granting entire toleration to the Protestants. Although Ferdinand was, personally, mild and pacific, his reign was troubled by domestic and foreign aggressions—the different sects disturbing the peace of the empire at home, while the French and the Turks assailed it from abroad. During the next fifty years, the empire was a prey to internal disquiet. Maximilian II. (1564—1576) was indeed a wise and just prince, but the little he was able to effect in reconciling the adherents of the different churches, and in raising the character of the imperial rule, was fatally counteracted by the bigotry and vacillation of his son and successor, Rudolf II. (1576—1612), in whose reign Germany was torn by the dissensions of the opposite religious factions, while each in turn called in the aid of foreigners to contribute towards the universal anarchy which culminated in the Thirty Years' War, begun under Rudolf's brother and successor Matthias (1612—1619); continued under Ferdinand II. (1619—1637), an able, but cruel and bigoted man; and ended under Ferdinand III. (1637—1657), by the treaty of Westphalia, in 1648. The effect of the Thirty Years' War was to depopulate the rural districts of Germany, destroy its commerce, burden the people with taxes, cripple the already debilitated power of the emperors, and cut up the empire into a multitude of petty states, the rulers of which exercised almost absolute power within their own territories. Leopold I. (1658—1705), a haughty, pedantic man, did not avail himself of the opportunities afforded by peace for restoring order to the state, but suffered himself to be drawn into the coalition against France, whilst his hereditary states were overrun by the Turks. Although success often attended his arms, peace brought him no signal advantages. The reigns of Joseph I. (1705—1711) and Charles VI. (1711—1740), with whom expired the male line of the Hapsburg dynasty, were signalised by the great victories won by the imperialist general, Prince Eugene, in conjunction with Marlborough, over the French; but they brought no solid advantage to the empire. The disturbed condition of Spain and Saxony opened new channels for the interference of Germany, which was further distracted, after the death of Charles, by the dissensions occasioned by the contested succession of his daughter, Maria-Theresa, and, through her, of her husband, Francis I. of Lorraine (1745—1765), after their rival, the Bavarian Elector, Charles VII., had, through the intervention of Prussian aid, been elected in 1742 to the imperial throne, which, however, he was obliged to cede, after a brief occupation of three years. Constant disturbances, intensified during the Seven Years' War, when Frederick the Great of Prussia maintained his character of a skilful general at the expense of the Austrians, made the reign of these sovereigns one of trouble and disaster. Joseph II., their son (1765—1790), during the lifetime of Maria-Theresa, who retained her authority over all the Austrian states, enjoyed little beyond the title of emperor, to which he had succeeded on his father's death. But when he ultimately acquired his mother's vast patrimony, he at once entered upon a course of reforms, which were, however, premature, and unsuited to the cases to which they were applied; whilst his attempts to re-establish the supremacy of the imperial power in the south of Germany were frustrated by Prussian influence. Leopold II., after a short reign of two years, was succeeded in 1792 by his son, Francis II., who, after a series of defeats by the armies of the French republic, and the adhesion, in 1805, of many of the German princes to the alliance of France, which led to the subsequent formation of the Rhenish Confederation under the protectorate of Napoleon, resigned the German crown, and assumed the title of Emperor of Austria. From this period till the Congress of Vienna of 1814—1815, Germany was almost entirely at the mercy of Napoleon, who deposed the established sovereigns, and dismembered their states in favour of his favourites and dependants, while he crippled the trade of the country, and exhausted its resources by the extortion of subsidies or contributions. As a reconstruction of the old empire was no longer possible, those states which still maintained their sovereignty combined, in 1815, to form a German Confederation. Of the 300 states into which the empire had once been divided, there now remained only 40, a number which has since been reduced to 35 by the extinction of several petty dynasties. The diet was now reorganised, and appointed to hold its meetings at Frankfurt-on-the-Maine, after having been formally recognised by all the allied states as the legislative and executive organ of the Confederation; but it failed to satisfy the expectations of the nation, and soon became a mere political tool in the hands of the princes, who simply made its decrees subservient to their own efforts for the suppression of every progressive movement. The French revolution of 1830 reacted sufficiently on some few of the German states to compel their rulers to grant written constitutions to their subjects; but the effect was transient; and it was not till 1848 that the German nation gave expression, by open insurrectionary movements, to the discontent and the sense of oppression which had long possessed the minds of the people. The princes endeavoured, by hasty concessions, to arrest the progress of republican principles, and, fully recognising the inefficiency of the diet, they gave their sanction to the convocation, by a provisional self-constituted assembly, of a national congress of representatives of the people. Archduke John of Austria was elected Vicar of the newly organised national government; but he soon disappointed the hopes of the assembly by his evident attempts to frustrate all energetic action on the side of the parliament, while the speedy success of the anti-republican party in Austria and Prussia damped the hopes of the progressionists. The refusal of the king of Prussia to accept the imperial crown which the parliament offered him, was followed by the election of a provisional regency of the empire: but as nearly half the members had declined taking part in these proceedings, or in a previous measure, by which Austria had been excluded, by a single vote, from the German Confederation, the assembly soon lapsed into a state of anarchy and impotence, which terminated in its dissolution. The sanguinary manner in which insurrectionary movements had, in the meanwhile, been suppressed by Prussian troops both in Prussia and Saxony, put an effectual end to republican demonstrations; and in 1850, Austria and Prussia, after exhibiting mutual jealousy and ill-will, which more than once seemed likely to end in war, combined to restore the diet, whose first acts were the intervention in Slesvig-Holstein in favour of Denmark, and the abolition of the free constitutions of several of the lesser states. Since that period, the diet has been the arena on which Austria and Prussia have striven to secure the supremacy and championship of Germany, and every measure of public interest has been made subservient to the views of one or other of these rival powers. These states did, however, conclude a treaty of alliance in 1854, guaranteeing to each other the mutual defence of their possessions against all enemies—a compact in which the diet soon joined. In 1858, a currency convention was concluded between all the states of the German Confederation, which had previously entered into similar alliances for the adjustment of international postal and commercial relations; and in the same year the diet adopted a resolution by which the Danish government was called upon to submit to the legislative assemblies a new project for the political organisation of the duchies of Holstein, Lauenburg, and Slesvig. In 1859, after many stormy discussions, the assembly passed a resolution to mobilise the whole federal army, and to appoint the Prussian Prince Regent commander-in-chief, subject to the control of the diet, or virtually of Austria, with which rests the casting-vote in the federal assembly. This appointment did not satisfy the ambitious views of Prussia, which has, however, abstained, during the last year or two, from making any very decisive attempt to secure the supreme political leadership in Germany. A strong anti-Napoleonic feeling has existed since the first outbreak of difficulties between France and Austria; and it may be stated generally, that the discussions and apprehensions to which this sentiment have given rise, together with the consideration of the Slesvig-Holstein difficulties, have constituted the principal questions under discussion in the federal parliament during the sessions of 1859, 1860, and 1861. See Schmidt, *Histoire des Allemands;* Eginhardus, *Vitâ Caroli Magni; Scriptores Rerum German. apud Menkenium;* Mannert, *Gesch. d. Teutschen;* Sismondi, *Histoire des Français*, 1819; *Europe during the Middle Ages*, in Lardner's Cabinet Cyclop., and *Hist. of the Italian Republics;* Putter, *History of the German Constitution;* Raumer, *Hist. of the Hohenstauffen;* Coxe, *House of Austria;* Pfeffel, *Abrégé Chronologique;* Harte, *Gustavus Adolphus;* Schiller's *Thirty Years' War;* Beausobre, *Hist. de la Réform.;* Mosheim's *Hist. of Lutheran and Reformed Churches;* Robertson's *Charles V.;* Eichhorn's *Deutsch. Staats-Rechtsgesch.;* Carlyle, *Hist. of Fred. II.*, &c.

German Language and Literature.—The numerous dialects which were spoken by the different confederacies and tribes of ancient Germany were all derivatives from one branch of the Aryan or Indo-Germanic family of languages, which separated from the parent stock at a very early period, although subsequently to the separation of the Celtic. We can trace the co-existence of the two branches of Teutonic speech known as Low-German and High-German as far back as the 7th c., but there is no evidence to shew that they existed as common uniform languages, from which their variously modified dialects were respectively derived. According to the eminent philologist Max Müller, there never was *one* common Teutonic language which diverged into two streams; while the utmost we can venture to assert in regard to the various High and Low German dialects is, that they respectively passed at different times through the same stages of grammatical development. The High-German branch—which was spoken in the dialects of Swabia, Bavaria, and Austria, and parts of Franconia and Saxony—has been the literary language of Germany since the days of Charlemagne. It may be classified under three periods—the Old High-German, dating from the 7th c., and extending to the period of the Crusades, or the 12th c.; the Middle High-German, beginning in the 12th c., and continuing till the Reformation; and the New High-German, dating from Luther's time to our own days. The Low-German, which in Germany itself has been little used in literature, comprehends many dialects, as the Frisian (q. v.), the Flemish, Dutch, Platt-Deutsch, &c. The oldest literary monument of Low-German belongs to the 9th c., and is a Christian epic known as *The Heliand* (the Healer or Saviour); and although there are traces of popular Low-German literature up to the 17th c., the translation of the Bible into High-German by Luther decided the fate of Low-German. In addition to the various dialects which are commonly included under the heads of High and Low German, an important evidence of the cultivation of a form of German differing equally from the High and Low groups has been preserved to us. This important linguistic monument is a fragment of a Gothic translation of the Bible, which was made in the 4th c. by Bishop Ulfilas, and used by all the Gothic tribes when they advanced into Italy and Spain. The Gothic language died out in the 9th c.; and after the extinction of the power of the Goths, the translation of Ulfilas was forgotten and lost sight of till the accidental discovery, in the

16th c., of a MS. preserved in the abbey of Werden, and containing fragments of this important work. This MS. is a copy made in the 5th c. of Ulfilas's translation, and fragmentary as it is, it affords evidence of the high degree of development to which this dialect had been carried, and exhibits a form of speech which belongs to neither the High nor Low German group, but very possibly may have been merely one among numerous other allied forms of Teutonic speech which have perished.

The diffusion of Christianity among the Germanic tribes had the effect both of suppressing the use of the Runic characters that had been common to them, and of changing the character of their literature, for instead of the heroic songs and 'beast-epics' of a sanguinary paganism (*Thier-epos*), scriptural paraphrases, legends, and hymns were now selected; while the ancient form of alliteration by degrees gave place to the rhythmical arrangement of the Latin versification common in the early periods of the middle ages. Latin, moreover, became the language of the court, the church, and the law under the Saxon emperors, while German was left entirely to the people, until the new ideas, which were diffused both in regard to literature and language during the Crusades under the rule of the accomplished emperors of the Hohenstauffen line, had the effect of reviving the use and cultivation of the vernacular dialects, among which the Swabian, as the language of the court, soon acquired a marked preponderance over the others. In that age of chivalry and romance, the art of song was cherished by princes and nobles, many of whom belonged to the order of the *Minnesänger* (or Singers of Love), and composed in the Swabian or High-German dialect of the imperial court. The subjects chiefly selected during the 13th and 14th centuries, both by courtly and popular singers, were based on the legendary lore of Charlemagne and his paladins, and King Arthur and his knights, and of the Sangrael; and it is to this period that we must refer the *Nibelungen Lied* and *Gudrun*, which rank as the greatest treasures of German national literature. Among the most successful poets and minnesingers belonging to the Swabian period, we may specially indicate Heinrich von Veldeke, Hartmann von der Aue, Wolfram von Eschenbach, Walther von der Vogelweide, Neidhart of Bavaria, Heinrich von Ofterdingen, &c. The taste for the *Thier-epos* received a new impetus among the people in the middle of the 12th c. by the re-translation, from the Walloon into German, of the ancient poem of *Reinhard Fuchs*, which, according to the distinguished philologist Jakob Grimm, originated with the Frankish tribes, who carried it with them when they crossed the Rhine and founded an empire in Gaul, and from whom it was diffused among the neighbouring tribes of Northern France and Flanders.

The period which succeeded the decline of chivalry was marked by a thorough neglect, among the higher classes, of national literature, which thus fell into the hands of the people, to the thorough disorganisation of all principles of grammar. To this age belongs, however, the great mass of the *Volkslieder*, or national ballads, in which Germany is specially rich; the fables and satires of Brand and of Sachs, and the romances of the satirist Johann Fischart. The mysteries and passion-plays, which were at their height in the 15th c., and still linger in the village of Oberammergau, in Upper Bavaria, may be said to have given origin to the German drama, which numbered among its earliest cultivators, Sachs, Rebhuhn, and Ayrer. The close of the 15th c. was prolific in rhyming historical chronicles, in satires on the clergy, and in theological writings for and against the tottering power of the Romish Church. The writings of Luther, his translation of the Bible, and the works of Ulrich von Hutten, Zuinglius, and of many of the other reformers, were, however, the most important events in the history of German literature from the close of the 15th to the middle of the 16th c.; and it must be remembered that Luther addressed himself to the minds of his countrymen not merely through his polemical writings, but also by those noble hymns, which, since his day, have constituted one of the greatest literary treasures of the kind. Some of the best of these *Kirch-lieder*, or church songs, were composed by Luther himself; while next to him those of Speratus, Decius, Nicolai, and Herberger, have perhaps found most favour both among Germans and foreigners. These fervent effusions of the devout and eloquent reformers were followed by a period of literary degeneration and stagnation, which is in a great measure to be ascribed to the demoralising effects of the Thirty Years' War, when Germany was a prey to all the evils inseparable from civil war fostered by foreign interference. The indirect result of this period of anarchy was to quench the national spirit, and vitiate the popular taste; for while the petty courts aped the habits, language, and literature of Versailles, the lower orders forgot their own literature, with its rich treasures of legends, tales, and ballads, and acquired a taste for the coarse camp-songs imported by foreign mercenaries, and the immoral romances borrowed from impure French and Italian sources. German poetry in the 17th c. was framed after the model of the later classics, and their modern imitators. The study of the genuine national literature was neglected, and although a host of learned societies were formed, whose professed object was to purify and elevate the public taste, the results were lamentably unsatisfactory; and it was not till J. C. Gottsched (1700—1766) succeeded in his *Critical Art of Poetry* in drawing attention to the turgid pedantry and artificial stiffness of the classicist school, that a better taste was awakened. His own pretentious bigotry gave origin, however, to a counter-party, from which emanated, at a somewhat later period, the German æsthetic school, under the guidance of A. Baumgarten and G. Meier. A favourable reaction now took place, and with the names of Klopstock, Lessing, and Wieland began the brilliant epoch of modern German literature. Their influence was alike great and varied; for while Klopstock's poem of the *Messiah*, and his odes, in which he had taken Milton as his model, re-echoed the tender piety of the old reformers, and were so thoroughly German in their spirit, that they at once met with an enthusiastic response in the hearts of the people, Lessing's tragedy of *Minna v. Barnhelm*, and his drama of *Nathan der Weise*, may be said to have created anew the dramatic art in Germany. Wieland, on the other hand, who was the complete antithesis of Klopstock, although, like his two great contemporaries, he was the founder of a new style, and gave a graceful flexibility to German diction, which it had never before been made to assume, had imparted to his numerous tales and romances an undisguised sensuous materialism, which, like his style, had been borrowed from the French philosophers of his day, and thus introduced into the language and literature of Germany the germs of many defects, as well as graces, to which they had hitherto remained strangers. The influence exerted on German literature by these three writers, who may be regarded as its regenerators, was soon appreciable in every branch of knowledge; and among the galaxy of great names which have imparted renown to the literary and scientific annals of Germany during the last 100 years, we can only instance a few of the principal writers who have more especially enriched the several departments of learning with which they have been associated.

Philosophy, which in Germany originated with Leibnitz, who, however, wrote in Latin and French, assumed a degree of individuality and completeness through the intellectual acumen and subtle analysis of Kant, Fichte, Schelling, and Hegel, which have no parallel in any other country. In theology, Reinhard, Paulus, Schleiermacher, and a host of others, have infused new life into biblical inquiry; while invaluable aid has been afforded in the same direction by the profound philological and critical researches of Wolf, Hermann, Müller, the erudite brothers J. and W. Grimm, Bopp, Benecke, Adelung, Lassen, Rosen, Schlegel, W. Humboldt, Lepsius, Bunsen, &c. In archæology, history, and jurisprudence, all nations owe a debt of gratitude to Winckelmann, Heeren, Von Raumer, Schlosser, Von Hammer, Gervinus, Dahlmann, Ranke, Niebuhr, and Mommsen. In poetry and belles-lettres, the name of Goethe (who lived from 1749 to 1832) is a host in itself. He had been preceded in the school to which he attached himself, which was known as that of the *Sturm- und- Drang* period, by Herder, its originator, whose philosophical critiques of foreign and German literature, by reviving a taste for the long-forgotten national poetry of Germany, and by exhibiting the weakness of the recent imitations of the French classicists, contributed materially to the complete literary revolution which ushered in the modern period of German poetry. In his *Leiden des Jungen Werther* (The Sorrows of Werther), Goethe carried the sentimental tendencies of the school to their culminating point; but while he was followed in the same path by a host of imitators, who brought the style into ridicule by their morbid exaggerations, his own later and very numerous works became in time more and more free from the blemishes into which he had led others, and remain imperishable monuments of the universality of his genius. The *Sturm- und- Drang* period closed with Schiller (1759—1805), who ranks in the estimation of his countrymen almost as high as Goethe himself, and whose early works, *The Robbers*, *Fiesco*, and *Don Carlos*, threw the whole German people into a frenzy of excitement. His later dramatic works, if less exciting than these, gave evidence of more matured taste, while some of his ballads and lyrics may be said to be unrivalled. In the present century, poetry has found noble representatives in the so-called *Vaterlandsdichter* (Poets of the Fatherland), among whom we may instance Theodor Körner, and Arndt, whose spirited patriotic songs are intimately associated with the war of 1813 against Napoleon, in which the former fell fighting gloriously. F. Rückert and L. Uhland belong to the same school; but the former is more especially known for his admirable adaptations and translations from the Oriental languages, and the latter for his exquisite romances and ballads. The influence of Goethe and Schiller extended in a marked degree to the drama and to novel-writing. In the former department, Iffland acquired great reputation as a writer of sensation dramas, A. von Kotzebue as an inexhaustible composer of light effective comedies, A. Müllner v. Honwald, F. Grillparzer, and E. Raupach for their historical and social tragedies, while C. Immermann (who is better known as the author of the novel *Münchhausen*), Mosen, Laube, and G. Freytag, have all produced good dramatic pieces. Among the host of novelists who have endeavoured to follow in the steps of the great leaders of the *Sturm- und- Drang* period, the majority are unworthy of notice. J. P. Richter, the satirist and humorist, stands forth, however, apart from, and far above his compeers; and few novelists ever exerted so lasting an influence on the literature and mode of feeling of their compatriots as that which Richter exercised over the minds of the middle classes of Germany, during the close of the last and the early part of the present century. Among other writers of note, we may instance De la Motte Fouqué, A. Hoffmann, and A. Chamisso, whose tendencies were to dwell on the mysterious agencies of nature, which they attempted to individualise, and bring into association with material forms, as in the *Undine* of the first, the fantastic tales of the second, and the *Peter Schlemihl* of the last-named. C. Pichler, Spindler, H. Steffens, C. Gutzkow, Sternberg, W. Häring (the imitator of Sir W. Scott), Hauff, Zschokke, an admirable writer of *novelettes*, Hackländer, Ida v. Hahn-Hahn, Auerbach, the narrator of village tales, and Freytag, the author of a social novel, *Soll und Haben*, have all in turn enjoyed universal popularity.

But numerous as have been writers of poetic and dramatic literature during the present century in Germany, the tendency of the German mind has of late years been rather to science than fiction; and the immense impetus given to the taste for scientific inquiry by A. v. Humboldt's travels and observations, and by his *Cosmos* and *Views of Nature*, has been followed by the prosecution of the most profound researches in every department of physical and natural science, and by the appearance of a multitude of records of travel, among the more important of which we can only instance a few, as, for example, those of Martius in Brazil, Pöppig in S. America, Tschudi in Peru, Schubert in Greece, Lepsius and Brugsch in Egypt, Schomburgk in British Guiana, Gützlaff in China, Siebold in Japan, the three brothers Schlagentweit in the Alps and in Central Asia, Barth and Vogel in Africa, and Leichhardt in Australia. In conclusion, we can only group together the names of a few of the many eminent Germans who by their labours have at once enriched the science of the world, and enhanced the literary and scientific glory of their own country. Without again referring to writers whom we may already have mentioned, we may specially instance, in astronomy and mathematics, Bessel, Encke, Struve, Gauss, and Mädler; in the natural sciences, and in medicine, J. Müller, Ehrenberg, Carus, Oken, Schleiden, Von Buch, Liebig, Kopp, Simon Dove, Valentin Moleschott, Bischoff, Rose, Poggendorf, Erdmann, Gmelin, Gräfe, Vogel, Rokitansky, Wagner, Schönlein, and Dieffenbach; in history and biography, Niebuhr, Leo, Duncker, Preuss, Böttiger, Varnhagen v. Ense, Pertz, Lappenberg, Pauli, &c.; in geography, ethnology, statistics, and travels, Berghaus, Petermann, Stein, Hübner, Klöden, Kohl, Reinbeck, Bunsen, Ideler, Lassen, Unger, Zimmermann; in the history of language, literature, and the fine arts, and on politics and the social sciences, Vilmar, Bouterwek, Kuno, Fischer, Waagen, Heinsius, Heyse, Becker, Creuzer, Lersch, Wachler, Ernesti, Jacobs, Savigny, Eichhorn, Bülow, Ersch. See Grimm, *Geschichte d. Deutschen Sprache*, and *Deutsche Grammatik;* Bopp, *Comparative Grammar;* Bessel, *Ueber das Leben des Ulfila;* M. Müller, *On the Science of Language;* Koberstein, *Grundriss der Deutschen Nationalliteratur;* Vilmar, *Vorlesungen über die Geschichte d. Deutsch. Nationalliteratur;* Hallam, *Europe in the Middle Ages.*

GE'RMEN (Lat. a sprout), or **O'VARY**, the lowest and thickened part of the Pistil (q. v.) of a flower; containing in its cavity the rudiments of the seeds, called *Ovules* (q. v.), attached to the *Placenta*

(q. v.) often by *umbilical cords* (q. v.). There is often only one ovule in the germen; sometimes it consists of a number of *Carpels* (q.v.), with one ovule in each; occasionally the cavity of the germen is divided into cells, each of these containing one, and often many ovules. When there are many ovules, some of them are generally abortive. The germen is sometimes *superior*—that is, it is *free* in the centre of the flower, as in the poppy, stock, and carnation; occasionally *inferior*, the calyx being adherent to it throughout, and the upper part or limb of the calyx thus seeming to arise from its summit, as in the gooseberry, rose, campanula, and snowdrop; sometimes it is half inferior, as in *Saxifraga granulata.* The germen develops itself into the *Fruit* (q. v.), after the flowering is over. Some plants bend their flower-stalks to the ground after flowering, press the germen into the ground, and ripen their fruit in the earth, as a species of Clover (*Trifolium subterraneum*), and the Ground-nut (*Arachis hypogœa*). See ARACHIS.

GERMINA'TION (Lat. sprouting), the beginning of growth in a seed, or of the vital action by which it is converted into a new plant. See SEED; and for what is peculiar to acotyledonous plants, see SPORE.

GERO'NA (anc. *Gerunda*), a city of Spain, in lat. 41° 58′ N., long. 2° 50′ E., capital of the province of the same name, is situated at the confluence of the Ter, with its affluent the Oñar, 60 miles north-east of Barcelona. It consists of an old and new town, the latter irregularly built on the declivity of a rocky hill, but highly picturesque, and containing a beautiful and lofty Gothic cathedral, commenced in 1316, and approached by a superb flight of steps. Besides the cathedral, there are five churches and twelve convents. The inhabitants carry on the manufacture of paper, soap, and leather; and spinning and weaving. The city is fortified by high thick walls, and protected by four forts. Pop. 13,959.

G. was of Roman origin, and was formerly the residence of the kings of Aragon. It has suffered much from sieges, of which the most noteworthy was that of 1809, when the French with 35,000 men encompassed and assailed the town. The besieged, unprovided with everything, even with ammunition, maintained a defence for seven months and five days against seven open breaches, and were forced to capitulate only when their heroic governor was struck down by famine and disease.

GEROPI'GIA, or JERUPIGIA. Of late years, a considerable quantity of this material has been sent from Portugal to this country. It consists of grape juice unfermented, and colouring matter, probably the extracts of rhatany-root and logwood, with sufficient brandy and sugar to preserve it from fermentation. It is used for giving a spurious strength and colour to red wines, more especially to those intended for exportation—the factitious compound being mixed or vatted with the wines in bond. At least 20,000 gallons are now imported annually, and this large trade has sprung up within the last fifteen years.

GERS, a department in the south-west of France, is formed of portions of the old provinces of Gascony and Guienne. The department of Landes intervenes between it and the Bay of Biscay, and that of Hautes-Pyrénées between it and the frontiers of Spain. It has an area of 2403 square miles, and a pop. of 304,497. The surface toward the south is mountainous, covered with ramifications of the Pyrenees, which extend northward in parallel lines. These lines decrease in height as they advance, and are separated by fan-shaped valleys, which are only a few yards wide in the south, but expand to a width of several miles in the north of the department. The principal rivers are the Gers—which gives its name to the department—the Losse, the Baise, the Arratz, the Gimone, and the Save. The climate is healthy and temperate. The soil is a stiff loam, resting on thick layers of clay, and is only moderately productive. More than one-half of the surface is devoted to agriculture, one-seventh is in vineyards, and the rest in meadows, heaths, and forests. Wine is produced in considerable quantity, but of an inferior quality; great part of it is converted into Armagnac brandy, which, after Cognac, is esteemed the best. The manufactures and exports are inconsiderable. The town of Auch is the capital.

GERSON, JEAN DE, one of the most eminent scholars and divines of the 14th and 15th centuries. His proper name was Jean Charlier, the name of G. being given to him from the place of his birth (1363), the village of Gerson in the diocese of Rheims. He was educated in the university of Paris, under the celebrated Peter d'Ailly. Here he rose to the highest honours of the university, and ultimately to its chancellorship, having acquired by his extraordinary learning the title of 'The Most Christian Doctor.' During the unhappy contests which arose out of the rival claims of the two lines of pontiffs in the time of the Western Schism, the university of Paris took a leading part in the negotiations for union; and G. was one of the most active supporters of the proposal of that university for putting an end to the schism by the resignation of both the contending parties. With this view, he visited the other universities, in order to obtain their assent to the plan proposed by that of Paris. But although he had the satisfaction to see this plan carried out in the council of Pisa, it failed, as is well known, to secure the desired union. In a treatise inscribed to his friend D'Ailly, he renewed the proposal that the rival pontiffs (now not two, but three since the election of John XXIII. at Pisa) should be required to resign; and in the new council held at Constance in 1414, he was again the most zealous advocate of the same expedient of resignation. It is to him, also, that the great outlines of the plan of church reformation, then and afterwards proposed, are due. But his own personal fortunes were marred by the animosity of the Duke of Burgundy and his adherents, to whom G. had become obnoxious, and from whom he had already suffered much persecution, on account of the boldness with which he had denounced the murder of the Duke of Orleans. To escape their vengeance, he was forced to remain in exile; and he retired from Constance, in the disguise of a pilgrim, to Rattenberg in Bavaria, where he composed his celebrated work *De Consolatione Theologiæ*, in imitation of that of Boëthius, *De Consolatione Philosophiæ.* It was only after the lapse of several years that he was enabled to return to France, and take up his residence in a monastery at Lyon, of which his brother was the superior. He devoted himself in this retirement to works of piety, to study, and to the education of youth. He died in 1429, in his 66th year. His works, which are among the most remarkable of that age, fill five volumes in folio. Among the books formerly ascribed to him was the celebrated spiritual treatise *On the Imitation of Christ;* but it is no longer doubtful that the true author is Thomas-a-Kempis. See KEMPIS. The authority of G. is much relied on by the advocates of Gallican principles; but the Ultramontanes allege that the principles laid down by him as to the authority of the pope are only applicable to the exceptional case in which he wrote—viz., that of a disputed succession, in which the claim of each of the rival popes, and therefore of the existing papacy itself, was doubtful.

GERSTÄCKER, Friedrich, a German novelist and traveller, was born at Hamburg, 16th May 1816. In 1837, he went to America. After spending some months in New York, he began his wanderings through the United States, sometimes as a stoker or sailor in various steam-packets, sometimes as a silversmith, a woodcutter, a maker of pill-boxes, &c., working till he had earned money enough to enable him to proceed further. He also led for a considerable period a wild adventurous life as a hunter in the forests. In 1842, he set up a hotel at Point Coupée, in Louisiana; but in 1843, a strong desire to see his friends induced him to return to Germany. Here he published his admirable *Streif- und- Jagdzüge durch die Vereinigten Staaten Nordamerikas* (2 vols., Dresden, 1844). This was followed by his *Die Regulatoren in Arkansas* (3 vols., Leip. 1846), *Die Flusspiraten des Mississippi* (3 vols., Leip. 1848), *Mississippibilder, Licht- und Schattenseiten transatlantischen Lebens* (2 vols., Dresden, 1847), and *Amerik. Wald- und- Strombilder* (2 vols., Leip. 1849). In his popular writings, as the *Reisen um die Welt* (6 vols., Leip. 1847), and *Der Deutschen Auswanderer Fahrten und Schicksale* (Leip. 1847), G. contrives to rivet the attention even of the uneducated reader. In 1849, G. again set out on his travels, and went from Rio Janeiro by Buenos Ayres to Valparaiso and California, whence he proceeded to the Sandwich Isles, crossed in a whaling-vessel to the Society Islands, went on to Sydney, travelled through Australia, and returned to Germany in 1852, where he has since resided. His contributions to the *Ausland* and *Allgemeine Zeitung*, containing an account of his recent travels, were collected and published under the title of *Reisen* (1853—1855). His works have been partly translated into French and English.

GE'RUND (from Latin *gero*, I carry on) is a part of the Latin verb which, according to grammarians, declares that anything is to be done. Thus the gerund of *scribo*, I write, is *scribendum;* as, *charta utilis ad scribendum*, paper useful for writing. It is a sort of verbal noun, possessing the same power of government as its verb, but is scarcely ever found in the nominative, at least as a governing word. In French, the infinitive has almost entirely supplanted the gerund, the sole surviving remnant, we believe, being found after the preposition *en*, as *en attendant*. In English, the present participle does duty also for the gerund; as, he is *reading* novels (participle); he amuses himself with *reading* novels (gerund).

GERVAS (*Stachytarpheta Jamaicensis*), a small shrub of the natural order *Verbenaceæ*, a native of the West Indies and warm parts of America. It has scattered hairy branches, oblong-ovate coarsely and sharply serrated leaves about two inches long, and long dense spikes of lilac flowers. It is regarded as a stimulant, febrifuge, anthelmintic, and vulnerary; a decoction of the leaves is applied to severe contusions; and the dried leaves are used as tea. In Austria, they are sold under the name of *Brazilian Tea*. In Britain, they are employed only for the adulteration of tea; but for this purpose they are perhaps more frequently used than any other kind of leaf.

GE'RVASE of Tilbury, an historian of the 13th c., was born at Tilbury, in Essex. He is said to have been a nephew of King Henry II. of England. About 1208, he was received with great distinction at the court of Otho IV., emperor of Germany, and appointed by that monarch marshal of the kingdom of Arles. He died about 1218. He wrote a commentary upon Geoffrey of Monmouth's History of Britain, entitled *Illustrationes Galfridi Monemuthensis*, lib. iv.; a History of the Holy Land (*Historia Terræ Sanctæ*); a treatise, *De Origine Burgundionum;* and a History of the Kings of England and France, comprised in a work entitled *Otia Imperialia*, libri tres; also known under the titles, *Mappa sive Descriptio Mundi*, and *De Mirabilibus Orbis*. MSS. of the *Otia Imperialia* are preserved in the Cottonian Collection, and in the library of Corpus Christi, Cambridge. Nicolson ascribes to G. the Black Book of the Exchequer (*Liber Niger Scaccarii*). Madox, who published a very correct edition of that work, makes Richard Nelson, Bishop of London, the author.

GERVI'NUS, Georg Gottfried, an historian of German literature and politician, was born at Darmstadt, 20th May 1805. He received a mercantile education, and was for some time employed in the counting-house of a merchant in his native town. By a diligent course of self-instruction, he supplied what was wanting in his school-education, and in 1826, was so far advanced as to be ready to enter the university of Heidelberg. After completing his studies, during which a taste for history had been awakened in him by Schlosser's lectures, he became teacher in an educational institution at Frankfurt-on-the-Maine. In 1835, he was appointed a professor extraordinary at Heidelberg. Previous to this, he had published his *Geschichte der Angelsachsen im Ueberblick* (Frank. 1830), which was followed by his *Historische Schriften* (Frank. 1833). In 1836, he was appointed ordinary professor of history and literature at Göttingen. He had now begun to publish his *Geschichte der Poetischen Nationalliteratur der Deutschen* (3 vols., Leip. 1835—1838; 3d edit. 1846—1848). This was followed by the *Neuere Geschichte der Poetischen Nationalliteratur der Deutschen* (2 vols., Leip. 1840—1842; 3d edit. 1852). Both of these works have attained to well-deserved popularity. In 1837, he was one of the Göttingen professors who signed the famous protest against the abolition of the Hanoverian constitution, in consequence of which he lost his chair, and was ordered to leave the country within three days. He first went to Darmstadt, then to Heidelberg, and in the spring of 1838, to Italy. He spent the winter in Rome, engaged in historical studies. In 1844, he was appointed honorary professor in the university of Heidelberg. From this period, his career was that of a political writer. Constitutional liberty was the object which he had in view, and for which he ardently laboured. His pamphlets and writings in different periodicals exercised a very great influence over the national mind. In July 1847, along with some others, he established the *Deutsche Zeitung* in Heidelberg, to advocate the political views of the Constitutionalists. In 1848, he was deputed to attend the diet in behalf of the Hanse towns, and was elected a member of the National Assembly by a district of Prussian Saxony. After the failure of the national democratic party in Germany, G. returned to his literary pursuits, the fruits of which are his able and suggestive work on Shakspeare (4 vols., Leip. 1849—1850), his *Geschichte der Deutschen Dichtung* (5 vols., Leip. 1853), and his *Geschichte des neunzehnten Jahrhundert* (Leip. 1st vol., 1853; 3d vol., 1858; English translation, 1859).

GESE'NIUS, Friedrich Heinrich Wilhelm, one of the greatest modern German Orientalists and biblical scholars, was born at Nordhausen, in Prussian Saxony, 3d February 1785, and educated first at the gymnasium of his native town, afterwards at the universities of Helmstedt and Göttingen. After having been a short time teacher in the pædagogium at Helmstedt, he became in 1806 a theological *Repetent* in Göttingen; and in 1809, on the proposal of Johann von Müller, was appointed professor of ancient literature in the gymnasium of Heiligenstadt. In 1810, however, he received a call to Halle as extraordinary professor of theology, and was made an ordinary professor in the following year. In 1810—1812, he published, in two volumes, a *Hebrew and Chaldee Dictionary of the Old Testament*, which underwent improvements in several subsequent editions, after he had made a journey to Paris and Oxford in the summer of 1820, to make researches in the Semitic languages. In the two years following the publication of this Dictionary, appeared his *Hebräisches Elementarbuch* (2 Bde., Halle, 1813—1814), consisting of a Hebrew grammar and reading-book. This work, as it has been improved in the recent editions of G.'s distinguished pupil and literary executor, Professor Rödiger of Halle, and the lexicon already mentioned, are still the grammar and dictionary of the Old Testament most in use not only throughout Germany, but in Great Britain and in America. The best English translations of the dictionary founded on the Latin edition are those of Robinson (American), and of Tregelles; the best of the grammar are those of Davies (London) and of Conant (New York). In 1815, another work was published by G. on the history of the Hebrew language (*Kritische Gesch. d. Hebr. Sprache u. Schrift*, Leip.), and a treatise, *De Pentateuchi Samaritani Origine, indole et auctoritate* (Halle). Besides a translation of Isaiah with a commentary in three vols. (Leip. 1820—1821), we are indebted to G. for a larger Hebrew Grammar (*Grammatisch-kritisches Lehrgebäude d. Hebr. Sprache*, 2 Bde., Leip. 1817), as well as for a larger lexicographical work (*Thesaurus philologico-criticus Linguæ Hebraicæ et Chaldaicæ Veteris Testamenti*), of which the first part was published in 1829, but which was completed only in 1858 by Professor Rödiger. G. contributed also some papers on Oriental Antiquity to Ersch and Gruber's *Allgemeine Encyclopädie;* and his notes to the German translation of Burckhardt's *Travels in Syria and Palestine*, throw light on many points connected with biblical geography. He died 23d October 1842, and a memorial of him appeared in the following year (*G., eine Erinnerung an seine Freunde*, Berlin, 1843).—Many of the results of the rationalising method of interpreting the Old Testament, which characterises all the works of G., have been unable to stand the progress of biblical science, and he has certainly been surpassed by Ewald in insight into the genius of the Hebrew language, and its bearing on the interpretation of Hebrew life and thought, as well as in all that qualifies the critic for a true historical, æsthetical, and religious appreciation of the literature preserved to us in the Old Testament. Yet his intense devotion to his favourite studies, and the advance which he made beyond all his predecessors in the establishment of more certain principles of Hebrew philology, undoubtedly entitle him to be regarded as having constituted a new epoch in the scientific study of the Old Testament.

GESNER, KONRAD VON, a celebrated Swiss naturalist, was born at Zürich in 1516, and died there of the plague 13th December 1565. His father, who was a leather-seller, was too poor to pay for more than the first years of his education at the town-school; but John Jacob Ammianus, professor of Latin and oratory in the college, saw in the boy so much promise, that he took him into his house, and instructed him gratuitously for three years in Latin, Greek, dialectics, and oratory. He subsequently studied for three or four years at Paris, whence he was summoned back to Zürich, to become a teacher in the school in which he had derived the elements of his own education. He devoted all his spare time to the study of medicine and botany, in the hope of ultimately rising from the office of a schoolmaster to that of a professor. The hope was gratified upon the opening of the university of Lausanne, when he was appointed professor of Greek. After holding the office three years, he went to Montpellier, where he attended medical lectures, and to Basel, where, after additional study, and the usual disputations, he was admitted to the degree of Doctor of Medicine. He then, at the age of twenty-five years, returned to his native town. In a very short time, he received the appointment of professor of philosophy, which he held until his death. He likewise practised medicine, and published from time to time the fruit of his studies. As, in the course of his life, he published no less than seventy-two works, besides leaving at his death eighteen that were in progress, it will be impossible for us to notice more than a few of the most important. His first great work, the *Bibliotheca Universalis*, appeared when he was only twenty-nine years old. It contained the titles of all the books then known in Hebrew, Greek, and Latin, with criticisms and summaries of each; and as an index to authors who wrote before the year 1545, it remains to this day very valuable. Ten years later (in 1555), his *Mithridates, de Differentiis Linguarum* appeared, which contained histories of one-hundred-and-thirty ancient and modern languages. But by far the greatest of his literary works was his *Historia Animalium*, which was planned in six books, of which only four were completed. The first treats of viviparous, and the second of oviparous quadrupeds (tortoises, lizards, &c.), the third of birds, and the fourth of fishes and aquatic animals. The fifth book was to have contained the history of serpents, and the sixth that of insects. Each of the four published books is a folio of considerable thickness, and with closely printed pages. In this work, which will ever remain a monument of his untiring industry, he aimed at bringing together all that was known in his time concerning every animal. The information which he collected regarding each animal was arranged under eight heads, represented by the first eight letters of the alphabet. These four volumes contain the complete history, up to the middle of the sixteenth century, of beasts, birds, and fishes, and well entitle their author to the designation which he often received of 'the German Pliny.'

Botany was probably the section of natural history with which he had the greatest practical acquaintance. He had collected more than five hundred plants undescribed by the ancients, and was arranging the results of his labours in this department at the time of his death. He appears to have been the first who made the great step towards a scientific classification of distinguishing genera by a study of the fructification.

GESNERA'CEÆ, a natural order of exogenous plants, allied to *Scrophulariaceæ*, and consisting of herbaceous plants and soft-wooded shrubs, generally tropical or sub-tropical. They frequently spring from scaly tubers. The leaves are wrinkled and destitute of stipules. The calyx is 5-parted; the corolla, tubular, 5-lobed, more or less irregular. The stamens are generally four, two long and two short, with the rudiment of a fifth. The germen is half inferior, surrounded at its base by glands or a fleshy ring; it is one-celled, and has parietal placentæ.

The fruit is either a capsule or a berry, many-seeded.—There are about 120 species, exclusive of those sometimes formed into a distinct order under the name *Cyrtandraceæ* or *Didymocarpeæ*, of which there are about 140. The true *Gesneraceæ* are all natives of the warmer parts of America, where some of them grow upon trees. The *Cyrtandraceæ* are more widely distributed.—Some plants of this order have mucilaginous and sweetish edible fruits; but it is chiefly remarkable for beauty of flowers, containing some of the most admired ornaments of our hothouses, as species of *Gloxinia*, *Achimenes*, &c.

GESSLER, Albrecht, called also G. von Bruneck, was in 1300 appointed joint-governor along with Berenger von Landenberg, of the Waldstädten or Forest Cantons (Schwytz, Unterwalden, and Uri), by Albrecht I. of Austria. According to the traditions connected with Tell (q. v.), his oppressive edicts and wanton cruelty so enraged the inhabitants that a conspiracy was formed against him, and he was shot by Tell in a narrow pass near Küssnacht in 1307.

GESSNER, Salomon, a German poet and artist, was born at Zürich, 1st April 1730, and apprenticed to a bookseller in Berlin in 1749, but soon ran away from his master, and endeavoured to earn a livelihood by landscape painting. From Berlin he went to Hamburg, where he formed an intimate friendship with Hagedorn. On his return to Zürich, he published *Daphnis*, which was followed by *Inkle und Yarico*, a small volume of idylls, and *Tod Abels* (the Death of Abel), a species of idyllic heroic prose poem, which, though the feeblest of all his productions, is the best known, and the one on which his claim to the notice of posterity rests. He afterwards turned his attention for several years exclusively to painting and engraving, in the latter of which arts he attained high excellence. Some of the engravings with which he illustrated his feeble poetry are said to be worthy of the first masters. In 1772, he published a second volume of idylls, and a series of letters on landscape painting. He died 2d March 1787.

GE'STA ROMANO'RUM is the title of the oldest legendary work of the middle ages. The stories are written in Latin, and for the most part are either taken from the histories of the Roman emperors, or at least are referred to the period in which these flourished. At a later period, moralising expositions were added, whence the work obtained the name of *Historiæ Moralistæ*. The G. R. belongs to that class of works with which the monks were wont to beguile their leisure hours, and which were appointed to be read in the refectory. The stories are short, and destitute of rhetorical ornament; neither have they any dialogues or tragic incidents. Their attractiveness lies in the charm of their naïveté and childlike simplicity, although their artless piety often passes into a deep mysticism. Down to the 16th c., the G. R. was one of the most widely read books among the learned, as the number of manuscripts and of printed impressions shortly after the invention of printing (the first was issued at Cologne in 1472) prove. At an early period, it was translated into French, English, German, and Dutch. The oldest Dutch translation was published at Gouda by Gerard Leeu in 1481; the oldest German translation at Augsburg, by Hans Schobser, in 1489. Among the older English translations may be mentioned that by R. Robinson (Lond. 1577). Recently (1824), the Rev. C. Swan published *Gesta Romanorum, translated from the Latin, with Preliminary Observations, and Copious Notes.* The later German fabulists and novelists, such as Hans Sachs, Burkard Waldis, and others, made abundant use of this great storehouse. But soon after the Reformation it was thrown into the background, and even in the monasteries, where for a long time it maintained its footing, it was at length forgotten. Recently, however, amid the general revival of interest in the literature of the past, it has received special attention. Its author has been supposed by some to have been Petrus Berchorius or Bercheur of Poitou, who died prior of the Benedictine Abbey of St Eloi in Paris in 1362, but it is now believed that he only added the moralisings; and Grässe, in an appendix to his German translation (2 vols., Dresd. and Leip. 1842), has shewn that a certain Elinandus is the author or compiler of the work. This Elinandus was undoubtedly a monk, and was either an Englishman or German, as is clear from the numerous Germanisms and Anglicisms that pervade the Gesta. The most recent edition of the original text is that of Keller (Stutt. and Tüb. 1842).

GESTA'TION, in Physiology, is the term applied to the period that intervenes in the mammalia between impregnation and the bringing forth of the young. The period and the number of young produced at a birth vary extremely in different mammals, but usually stand in an inverse ratio to one another. Thus, in the larger herbivora, as, for example, the elephant, the horse, the ox, and the camel, the female seldom produces more than one at a time, but the period of gestation is long; while in the smaller ones the progeny is numerous, but the period of gestation only a few weeks. In the elephant, the period of gestation extends over twenty or twenty-one months; in the giraffe, it is fourteen months; in the dromedary, it is twelve months; in the mare, upwards of eleven months; in the tapir, between ten and eleven; in the cow, nine; and in many of the larger deer somewhat more than eight months. In the sheep and goat, the period is five months. In the sow, which produces a numerous litter, the period is four months. In the rodentia, the progeny is numerous and imperfectly developed, and the period of gestation is comparatively short: in the beaver, one of the largest of the order, it is four months; in the rabbit and hare, from thirty to forty days; in the dormouse, thirty-one days; in the squirrel and rat, four weeks; and in the guinea-pig, three weeks or less. The young of the carnivora, like the young of the rodentia, are born with their eyes closed, and in a very immature condition; and in even the larger carnivora the period of gestation is far shorter than in the larger ruminantia or pachydermata: it is six months in the bear; one hundred and eight days in the lion (the period in this animal is stated by Van der Hoeven at three months); seventy-nine days in the puma; sixty-two or sixty-three days in the dog, the wolf, and the fox; and fifty-five or fifty-six days in the cat. In the marsupial animals, which, from a structural peculiarity, produce their young in a far more immature state than any other mammals, the period of gestation is very short, being thirty-nine days in the kangaroo, the largest of the marsupial animals, and only twenty-six days in the opossum. Nothing certain is known regarding the period of gestation of the cetacea. The quadrumana produce one, sometimes two, at a birth; and the period of gestation, as far as has been observed, seems to be seven months. In the human race, forty weeks is the usual period of gestation, but this period is liable to certain deviations, which are noticed in the article Fœtus.

GE'TÆ, a people of Thracian extraction, who, when first mentioned in history, inhabited the country which is now called Bulgaria. They were a warlike people, and for a long time successfully resisted the attempts of Alexander the Great and Pyrrhus to subdue them. They afterwards removed to the north bank of the Danube, having the Dnieper as their boundary on the east, while westward they encroached on the Roman empire, with which from this time they were continually at war. They were called Daci by the Romans, and their country Dacia, and are often mentioned in the literature of the Augustan era as savage and unconquerable foes. During the reign of Domitian, they overcame the Romans, and exacted an annual tribute. But in 106, their gallant king, Decebalus, was defeated by Trajan, and the people completely subdued. A Roman colony was settled in the country, and becoming incorporated with the G., gave rise to a mixed race, the modern Wallachs.

GETHSE'MANE (Heb. *Gath*, 'a wine-press,' and *Shemen*, 'oil'), the scene of our Saviour's agony on the night before his Passion, was a small farm or estate at the foot of Mount Olivet, and rather more than half a mile from the city of Jerusalem. Attached to it was a garden or orchard, a favourite resort of Christ and his disciples. The spot pointed out to modern travellers as the site of the garden of G. corresponds sufficiently with the requirements of the Scripture narrative, and the statements of Jerome and Eusebius. It is a place about 50 paces square, enclosed by a low wall of loose stones, and contains eight very old olive-trees, regarded with pious superstition as having existed in the time of our Lord.

GE'UM, a genus of plants of the natural order *Rosaceæ*, sub-order *Potentilleæ*, nearly allied to *Potentilla*, but distinguished by the hardened hooked styles which crown the carpels, so that the fruit becomes a bur. The carpels are dry. Two species are common natives of Britain, *G. urbanum*, called COMMON AVENS, or HERB BENNETT, a herbaceous plant, about 1—2 feet high, and *G. rivale*, called WATER AVENS, about one foot high, both of which have the radical leaves interruptedly pinnate and lyrate, and the cauline leaves ternate, but *G. urbanum* has erect yellow flowers, and *G. rivale* has nodding flowers of a brownish hue. The former grows in hedges and thickets, the latter in wet meadows and woods, and sometimes even in very alpine situations. Both are aromatic, tonic, and astringent, and are employed to restrain mucous discharges, and in cases of dysentery and intermittent fever. The root of *G. rivale* is also used in diseases of the bladder. The root of G. *urbanum*, when fresh, has a clove-like flavour, which it communicates to ale; and for this purpose it is gathered in spring before the stem grows up. G. *Canadense*, the CHOCOLATE ROOT or BLOOD ROOT of North America, has some reputation as a mild tonic. It is much employed in the United States in diseases of the bladder. It much resembles the British species in its leaves, and has erect flowers like *G. urbanum*. A number of other species are known, natives of the temperate and colder regions both of the northern and southern hemispheres.

Geum Rivale:
a, carpel and awn; *b*, petal; *c*, stamen; *d*, pistil.

GEY'SER (Icelandic, *geysa*, to burst forth violently, allied to Eng. *gush*) is a term applied in Iceland to the eruptive thermal springs and wells which are found in various parts of its surface in evident connection with the volcanic forces at work below. The most remarkable group of these singular objects is one about 70 miles, or a two days' ride from Reikiavik, 16 miles north of Skalholt, and within sight of the volcano of Hecla. On the slope of a low trap-hill, overlooking the wide grassy valley of the Whitae, or White River, a space of ground measuring perhaps half a mile each way is thickly interspersed with boiling or hot springs, of various sizes, from jets not greater than an overboiling tea-kettle, up to great caldrons, besides vestiges of others no longer in operation. All are surrounded by silicious incrustations, formed in the course of time by the minute charge of silica infused into the water. The chief apertures are two, respectively called the *Great Geyser* and the *Strokr* (i. e. Churn), which are little more than a hundred yards apart. The latter is an irregular aperture of from six to eight feet diameter, down which one may in general safely look, when he sees the water noisily working in a narrower passage about 20 feet below. If, by throwing in a sufficient quantity of turf, he can temporarily choke this gullet, the water will in a few minutes overcome the resistance, and, so to speak, perform an eruption with magnificent effect, bursting up 60 feet into the air, brown with the turf that has been infused into it, and diffusing steam in vast volumes around.

The appearance of the Great Geyser is considerably different. On the summit of a mount which rises about 15 feet above the surrounding ground, is a circular pool or cup of hot water, 72 feet across at its greatest diameter, and about four feet deep, being entirely formed of silicious crust of a dull gray colour. At the edge, this water has been found to be 188° F.; in the centre, it is considerably higher. From the centre descends a pit of eight feet width, and 83 feet deep, up which a stream of highly heated water is continually but slowly ascending, the surplus finding its way out by a small channel in the edge of the cup, and trickling down the exterior of the crusty eminence. Every few hours, the water, with a rumbling noise, rises tumultuously through the pit, and jets for a few feet above the surface of the pool; by and by, it subsides, and all is quiet again. Once a day, however, or thereabouts, this tumult ends in a terrific paroxysm, which lasts perhaps a quarter of an hour, and during which the water is thrown in repeated jets from 60 to 80 feet high, mingled with such volumes of steam as obscure the country for half a mile round. If a visitor be tolerably near on the windward-side, he may catch glimpses of this grand spectacle—the eruption of a water-volcano, it may be termed—and he must needs be charmed with the beautiful jets as they curve outwards and fall, as well as impressed by the sublimity of the whole scene. When quiet is restored, the chalice, and perhaps twenty feet of the pit, are found empty, and the visitor obtains, so far, a sight of the internal arrangements and structure of the geyser. In a little time, the water reascends to its usual level, and there remains for the next day or two, with only those minor disturbances which have been described.

The thermal springs and wells of Iceland may be said to be of three classes—1. Those of continual and uniform ebullition; 2. Those which, while not constantly ebullient, are liable to occasional eruptions; and, 3. Certain wells not yet particularised, which contain tranquil tepid water, but are supposed (at least in some instances) to have formerly been eruptive. It is only in regard to the second class that there is any room for doubt or speculation. To what are we to attribute the occasional eruptions?

The theory started by Sir George Mackenzie, who visited Iceland in 1810, is, that steam is gathered in some cavernous recess connected with the subterranean channels through which the water rises; and that, when it has accumulated there till such time as the pressure overcomes the resistance, it bursts forth through the tube, carrying the water before it, and tossing it high into the air. This mechanical theory, as it may be called, has lost ground since the announcement of a chemical one by Professor Bunsen, who spent eleven days beside the Great Geyser in 1846. The learned German looks for an explanation of the phenomena to the molecular changes which take place in water after being long subjected to heat. 'In these circumstances,* water loses much of the air contained in it; the cohesion of its molecules is greatly increased, and a higher temperature is required to boil it. When water in this state is brought to the boil, the production of vapour is so instantaneous and so considerable as to cause an explosion. It has been found that the water of the Great Geyser at the bottom of the tube has a temperature higher than that of boiling water, and this goes on increasing till an eruption takes place, immediately before which it has been found as high as 261° F. This peculiarity—for so it is, seeing that, in ordinary circumstances, the hotter water at the bottom would rise to the top till all was equally warm—shews that the heating of the water in the Geyser takes place under extraordinary circumstances. As far as I understand Professor Bunsen, he implies that the great pressure of the column above, and perhaps some mechanical impediments to free circulation in the form of the Geyser, give these required circumstances. Such being assumedly the case, there is an increase in the cohesion of the molecules of the water constantly going on at the bottom, at the same time that the heat is constantly increasing; at length, the latter force overcomes the former—ebullition takes place—an immense volume of vapour is instantaneously engendered, and an eruption is the consequence.' We have to consider this theory in an unusually curious light in connection with a small double geyser, as it may be called, which exists in the group at Reikholt, and in which each pool makes an eruption every few minutes, the other being at those times pacific.

The water of the Great Geyser contains soda in various forms; but the chief ingredient is a charge of about 31 grammes of silica to six gallons. This forms the incrustations around the pools, reaching to the bulk of a little hill in the case of the Great Geyser.

GFRÖRER, August Friedrich, a German historian, was born at Calw, in the Black Forest, 5th March 1803. Although he studied for the church, he had lost all taste for its practical work when he completed his theological education in 1825. After spending some time at Lausanne and Geneva, where he mastered the French language, he went to Rome in 1827 to study Italian. On his return next year, he became a *Repetent*, or tutor, in the theological institution at Tübingen; in 1829, he was removed to a similar situation in Stuttgart; and in 1830, he was appointed national librarian. He now abandoned ecclesiastical life entirely, and devoted himself to literature. The first fruit of his studies was a work on Philo and the Judæo-Alexandrian Theosophy in their relation to the doctrine of the New Testament (*Philo und die Jüdisch-Alexandrinische Theosophie*, 2 Bde., Stutt. 1831). This formed the first part of a larger work on the History of Primitive Christianity (*Gesch. d. Urchristenthums*), which was completed in 1838 in three other parts. Between the beginning and completion of this work, G.'s views on Christ and Christianity had undergone a change, which appeared also in his History of Gustavus Adolphus and his Times (*Gustav Adolf, König von Schweden, und Seine Zeit*, Stutt. 1833—1837), for the first edition of that work takes at the commencement the side of the Guelphs, and towards the close, that of the Ghibellines—an impropriety which was corrected in the second edition (1844—1845). After a work on the *Prophetæ Veteres Pseudepigraphi* (Stutt. 1840), G. published his *Allgemeine Kirchengeschichte* (Stutt. 1841—1846), which has reached the 7th vol., and brings church history down to 1305. While working at this history, he came to the conviction that the true church is the historical, i. e., the apostolical Roman Catholic, and that the Reformation originated to a large extent in misunderstanding and the ambition of princes. He was accordingly called in 1846 to the Catholic university of Freiburg, and there, by his zeal in defending the interests of the university, was drawn into manifold conflicts, which were fought again more earnestly at the Frankfurt parliament in 1848, where he was one of the most decided adherents of the party called the *Grossdeutschen*. In 1848 appeared his History of the Carlovingians of Eastern and Western Franconia (*Gesch. d. ost- u. westfränkischen Karolinger*, 2 Bde., Stutt.); in 1855, the first two volumes of a work on the Early History of Mankind (*Urgesch. d. menschlichen Geschlechts*, Schaff.); and in 1861 the concluding volume of a large work on the times of Gregory VII. (*Pabst Gregorius VII. und Seiner Zeit*, 7 Bde., Schaffh.).

GHAMBARU, formerly a celebrated town of Africa, in the state of Bornu, in lat. 13° 5′ N., and long. 12° 5′ E. During the flourishing period of the Bornuese empire, it was the favourite retreat of the kings of the country. It was taken and destroyed by the Fulahs in 1809, and since that date has remained in a state of utter ruin and desolation; so that now almost all traces of the town have become covered with vegetation, and enveloped in the surrounding forest. The most interesting relic of G. is a well-preserved portion of an ancient edifice, evidently a mosque. This mosque was built of bricks, which, although not so regularly shaped as European bricks, are in other respects said to be quite as good. G. stands in the midst of a district comprising the finest land of Bornu, and which, before the beginning of the present century, was loud with the noise and bustle of hundreds of towns and villages; now, however, it is the haunt of the elephant and the lion; the silence of solitude has overspread it, and it has sunk back into the condition of the primeval jungle.

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* This account of Bunsen's theory is from a series of articles entitled *Tracings of Iceland*, which appeared in *Chambers's Journal* in 1855, and subsequently in a small 8vo volume, 1*s*., published by W. and R. Chambers.

GHA'RA, formed by the junction of the Sutlej and the Beas, the most easterly of the rivers of the Punjab, unites with the Chenab, which has previously collected the remaining three of the five, to form the Punjnud, which thus carries the whole into the Indus. The distance between the two points of confluence is about 300 miles. The G. is nowhere fordable at any season; and its breadth varies from 200 yards to 500.

GHASEL, or **GHAZEL**, a favourite form of lyrical poetry among the Turks and Persians. It is composed of not less than five, and not more than seventeen strophes of two lines each, all the second lines of which rhyme together. The last couplet always contains the real or assumed name of the author. In regard to matter, the ghasel is either purely erotic and bacchanalian, or allegorical and mystical. Western scholars regard it as the Oriental sonnet. Hafiz is unsurpassed in this kind of verse, and it has also been happily imitated by the German poets, Platen, Rückert, Bodenstedt, &c.

GHÂTS, or, as usually written, **GHAUTS**, are buildings erected along the banks of rivers, in order to afford easy access to bathers. They are peculiar to Northern Hindustan, and line the river banks in most of the great cities, more especially those situated on the Ganges. A ghât consists in general of a long, high building, fronting the river, to which access is had by means of several flights of steps, these latter forming the essential part of the structure, as the wall or building is only for the protection of loungers from the sun's rays. The uniformity of the long lines of steps is broken by small projections, often crowned by kiosks, which relieve the eye. 'Upon these ghâts,' says one traveller, 'are passed the busiest and happiest hours of a Hindu's day. Escaping from the narrow unwholesome streets, it is a luxury for him to sit upon the open steps, and taste the fresh air of the river; so that on the ghâts are concentrated the pastimes of the idler, the duties of the devout, and much of the necessary intercourse of business.' Though the Ganges, being the sacred river, is *par excellence* the river of ghâts, one of the most beautiful in Hindustan is that erected at Maheswar, on the Nerbudda, by Alaya Baiee, the widow of Holkar; and though Benares prides itself upon possessing the greatest number of ghâts, it is almost rivalled by Ougein and other cities. For a fuller account of these structures, see Fergusson's *Hand-book of Architecture.*

GHAUTS (in English, *Gates* or *Passes*) are two converging ranges of mountains, which run parallel with the east and west coasts of the peninsula of Hindustan, and hence known as the *Eastern* and *Western* G.—1. The Eastern G. extend, with an average height of 1500 feet, from the vicinity of Balasore, in lat. 21° 30′ N., a little north of the Mahanadi, to within 20 miles of Cape Comorin. Before joining the kindred ridge at this last-mentioned point, they send forth, about 36 miles to the north of Madras, a common spur, as it were, of both ranges, which reaches the other range to the north of the gap of Palghatcheri. To the south of the departure of this connecting chain, the Eastern G. become less continuous and distinct. Moreover, they are nowhere a water-shed on any considerable scale, being penetrated and crossed by nearly all the drainage of the interior.—2. The Western G. stretch from the south side of the Tapti, about the same latitude as Balasore, to their junction with the kindred ridge, at a distance of 20 miles from Cape Comorin, or rather, in fact, to Cape Comorin itself. Though they are generally far more continuous and distinct than the G. Eastern, yet they are sharply divided by the gap of Palghatcheri, 16 miles broad —the northern section measuring 800 miles in length, and the southern 200. Their general elevation appears to vary from about 4000 feet to fully 7000. The peak of Dodabetta in that portion of the Western G. known as the Neilgherries, is said to be 8760 feet above the level of the sea. The opposite faces of these mountains differ very remarkably from each other. Landward, there is a gradual slope to the table-land of the Deccan; seaward, almost perpendicular precipices, speaking generally, sink at once nearly to the level of the sea, at a distance from it ranging from 40 to 70 miles, but at one place approaching within 6 miles. From this peculiarity, aggravated, as it is, by the incredibly heavy rains which the south-west monsoon dashes against the lofty barrier before it, the maritime strip, more particularly towards the south, presents that singular feature of the country which is known as the 'Backwaters.' See COCHIN. The Western G. are, with hardly an exception, a water-shed, for not a single stream of any magnitude finds its way through them.

GHAZIPO'RE, a city of Hindustan, capital of a district of the same name, stands on the left bank of the Ganges, in lat. 25° 32′ N., and long. 83° 39′ E. It contains about 8000 inhabitants. The mean temperature of May, the hottest month, is 97° F.; and of January, the coldest month, it is 56°. The air is said to be comparatively salubrious. The place owes this advantage to the porous character of the soil; and it has, moreover, a long reach of the river towards the south-east—the quarter from which the hot winds generally blow.

GHAZZA'LI, ABU HÁMID MOHAMMAD IBN AHMAD, surnamed ZAINEDDIN (glory of the law), one of the most eminent Mohammedan philosophers and divines, and one of the warmest adherents of Sufism (q. v.), born in 450 H. (1058 A.D.) at Tus, in Khorassan, the birthplace also of Firdusi, and burial-place of Harun-al-Rashid. The surname of G. was given to him, according to some, because his father dealt in *ghazal* or spun cotton. Left an orphan at an early age, by the advice of his guardian, a Sufi, he went to Djorshan, with the intention of devoting himself to study and science, as a means of support, and became the favourite pupil of Abu Nasr Ismail, an eminent teacher of the time. He afterwards betook himself to Nishapur, where he attended the lectures of the learned Imam of the two sanctuaries (Mecca and Medina) on law, polemics, philosophy, and theology, and remained till the death of his instructor. The grand vizier of Bagdad then appointed him (1091 A. D.) to a professorship at his *Nizamjê* (university), which he left four years later, in order to perform the holy pilgrimage to Mecca. On his return, he visited Jerusalem and Damascus, and remained for ten years at the mosque of the latter place, leading a studious and ascetic life. He afterwards visited Cairo, Alexandria, and other places in Africa, everywhere teaching and lecturing on religion and science, and also returned for a short time to Nishapur; but he finally went back to Tus, his native place, where he died 505 H. (1111 A. D.), having founded a monastery for Sufis, and a college for the studious.

Of the ninety-nine works written by him (mostly in Arabic, a few in Persian), the most famous is his *Ihjá Olúm ad-Dín* (Restoration of Religious Sciences), a work so remarkable and exhaustive, that it has been said: 'If all the books of the Islam were lost, and we had only this one left, we should not miss the others' (*Haji Khalifah*). The academies of the West, however, Cordova, Marocco, Fez, &c., condemned it as contrary to the teachings of the Sunna (q. v.), and had it publicly burned. Next in importance stands his great philosophical work *Taháfat Al-Filásafah* (The Overturning of the Philosophers), which has survived only in Hebrew translations, and which gave rise to a warmly contested controversy between him and Averroës (Ibn Roshd). We may mention also his commentary on the ninety-nine names of God, and an ethical treatise, *O Child!* published and translated into German by Hammer-Purgstall. About one-third only of his works is known to have survived, and of this but a very small part has been published.

GHEE, a kind of butter used in many parts of India, and generally prepared from the milk of buffaloes. The fresh milk is boiled for an hour or more; it is then allowed to cool, and a little curdled milk, called dhye, is added to promote coagulation. The curdled mass is churned for half an hour; some hot water is then added; and the churning continued for another half hour, when the butter forms. When the butter begins to become rancid, which is usually the case after a few days, it is boiled till all the water contained in it is expelled, and a little dhye and salt, or betel-leaf, is added; after which it is put into closed pots to be kept for use. It is used to an enormous extent by the natives of many parts of India, but is seldom relished by Europeans.

GHEEL, a well-known colony for the insane, is a town of Belgium, in the province of Antwerp, and 26 miles east-south-east of the town of that name. It is literally an oasis in a desert; a comparatively fertile spot, inhabited and cultivated by 10,000 or 11,000 peasants, in the midst of an extensive sandy waste, called the Campine, where neither climate, soil, nor surroundings invite a settlement. There are no gentlemen's seats in the district, and the farmhouses, though neat, and generally surrounded by trees and a garden, are evidently in the hands of the poor. Their frequency shews this. They are sometimes built of brick; much more generally, they are constructed of wattled or wicker work, thickly laid over with mud or plaster, and whitewashed. A G. crofter's house is much larger than the dwelling of a small farmer in Scotland. The people inhabiting these seem to be about the rank of English cottagers, but are inferior in aspect, tone of character, and cleanliness of habits. The dwellings are arranged into three classes, or cordons: those of the village proper; those scattered around in its immediate vicinity; and those collected into hamlets in the more distant and least reclaimed portions of the commune, which may be about 20 miles in circumference.

Historically considered, G. is noted as having been the spot where a woman of rank, said to have been of British origin, was murdered by her father, in consequence of her resistance to his incestuous passion. The pagan in his revenge gave the church a martyr. Pilgrims, the sick, the sorrowful, and the insane, visited the tomb of the Christian virgin; the last were restored to sanity and serenity. Dymphna became the tutelar saint of those stricken in spirit; a shrine rose in her honour, which now, for ten centuries, has been consecrated to the relief of mental disease, is said to have been distinguished by never-failing success, and, at all events, has collected around it hundreds of lunatics, chiefly of the poorer classes, but labouring under every form and stage of nervous malady. Formerly, besides the benefit derivable from proximity to the ashes of the saint, and from the prayers of the church, the afflicted underwent a sort of novitiate in a building adjoining the church, where they were chained to the wall, and subsequently passed under the mausoleum of their patron, &c.; but now, although faith lingers, there do not appear to be any other than the ordinary ministrations of the church to which the patients belong, resorted to as treatment.

About 800 insane persons are lodged with the citizens of this community, or with 600 heads of families, and are controlled and employed by them, and this without recourse to walls or ha-has, or other asylum appliances, and with little coercion of any kind. The quiet and industrious reside generally one in each family in the town, the more excited in the suburban cottages, and the most unmanageable with the labourers on the confines of the commune. The effect produced by this large body of lunatics wandering, working, displaying many of their peculiarities in the midst of a thriving sane population, who chiefly depend upon a traffic in insanity, is both striking and picturesque. In the enjoyment of comparative liberty, and of what is called the free-air treatment, these patients are, upon the whole, contented, tranquil, and healthy. Violence is rare; only two suicides have occurred in four years; and morality is less outraged than in more protected classes. Each individual is maintained for about 6½*d.* to 7½*d. per diem.* Until recently, this colony was merely a psychological curiosity; recently, the anomaly and absurdity of treating all cases alike, and independently of medical aid, have led to the institution of a medical staff, the erection of an hospital, and the introduction of many salutary alterations in the relations between the insane and their custodiers, in classification and supervision. The compatibility of the seclusion of the insane with greater freedom, with domestic life, and association with the sane, have suggested the introduction of cottage asylums, as a modification in the accommodation of this class in this country. (*Gheel ou une Colonie d'Aliênés vivant en famile et en libertè*, par M. Jules Duval. Paris, 1860.)

GHENT (Flem. *Gend*, Ger. *Gent*, Fr. *Gand*), an important city of Belgium, capital of the province of East Flanders, is situated at the confluence of the Lys and the Scheldt, 31 miles west-north-west of Brussels. It is divided by canals into 26 islands, connected by 270 bridges, and is encompassed with gardens, meadows, and pleasant promenades. It is surrounded by walls, pierced by seven gates, and enclosing an area eight miles in circuit, and is in general well built; but in the older part its quaint and fantastic houses render it in the highest degree picturesque. Among the chief buildings are the Church of St Bavon, containing the famous 'Adoration of the Lamb,' by the brothers Van Eyck; the new citadel, finished in 1830; the Palace of Justice, built in 1844, and having a peristyle of the Corinthian order; the university, connected with a school for civil engineering, and for trades and professions; the Beguinage, a convent containing about 700 nuns; the royal Gymnasium; and the Academy of Painting. The cotton and woollen manufactures are carried on on a great scale. There are about 60 cotton-mills, and upwards of 15,000 workmen are employed in the spinning, printing, dyeing, and weaving of cotton, woollen, and linen fabrics. Leather and paper are also manufactured, and a flourishing trade is carried on in floriculture. Eight extensive flower-dealers are engaged in this branch of trade, and upwards of 400 hothouses are required. The commerce of G. is important. By the Great Canal, which flows into the Scheldt, it is united with the sea, and it can receive into its docks vessels drawing 18 feet of water. The new dock or basin on the north-east side of the city is capable of holding 400 vessels. Pop. 109,618.

G. is mentioned in history as early as the 7th century. About the year 868, Baldwin Bras-de-Fer, the first Count of Flanders, built a fortress here as a defence against the Normans. Under the Counts of Flanders, G. continued to prosper and increase, until, in the 14th c., it was able to send 50,000 men into the field. The wealth of the citizens of G., and the unusual measure of liberty which they enjoyed, encouraged them to resist with arms any attempt to infringe upon their peculiar rights and privileges. This readiness to arm in their own defence is exemplified in the famous insurrection of Jacob van Artevelde (q. v.), and other instances. For many years, it maintained a vigorous, but unavailing resistance against the Dukes of Burgundy—who wished to be recognised as Counts of Flanders—and the kings of Spain. In the various wars of which the Netherlands has been the battle-ground, G. suffered severely, and was frequently taken. In 1792, the Netherlands fell under the power of France, and G. was made the capital of the department of the Scheldt, continuing under French dominion until the fall of Napoleon, in 1814, when it was incorporated with Flanders in the kingdom of the Netherlands.

GHERARDE'SCA, a family of Tuscan origin, which enacted a conspicuous part in the history of the Italian republics during the middle ages. Their vast territorial possessions lay between Pisa and Piombino. In the 13th c., the Counts G. exercised a preponderating authority in the republic of Pisa, and were prominent supporters of the popular interests, in opposition to the encroachments of the nobles. In the great feud between the Guelphs and Ghibellines, they became warm partisans of the latter, and were the irreconcilable enemies of the Visconti, who headed the Guelphs. The most famous of this family, both with respect to the historical events of his career, and the appalling tragedy of his fate, is Count Ugolino, whose name and fate have been invested with undying interest by Dante. Count Ugolino, more than any of his race, was possessed by a lawless ambition, and a subtle, unscrupulous spirit. Having resolved to usurp supreme power over Pisa, he formed an alliance with Giovanni Visconti, the head of the Guelphic party, who promised to supply him secretly with soldiers from Sardinia. The plot was, however, discovered, and both Giovanni and Ugolino were banished from the city. The former died soon after; but the latter, uniting himself with the Florentines and the Lucchese, forced the Pisans, in 1276, to restore him his territories, of which he had been deprived. No sooner was he reinstated in his possessions than he began to devise anew ambitious schemes. The war of the Pisans with the Genoese afforded him the opportunity he desired. In the battle fought at the island of Malora, 6th August 1284, Ugolino, by treacherously abandoning the Pisans, occasioned the complete annihilation of their fleet, together with a loss of 11,000 prisoners. When the news of this disaster spread, the Florentines, the Lucchese, the Sienese, the Pistoians, and all the other enemies of the Pisan republic, gathered together to destroy it, as the stronghold of the Ghibellines in Italy. Being thus brought to the brink of ruin, the Pisans had no other resource left than to throw themselves into the arms of him whose treachery had reduced them to such misery. From the time of his election, he gave free scope to his vindictive, despotic nature, persecuting and banishing all who were privately obnoxious to him, on pretexts of state delinquency, till at length a conspiracy was formed against him, headed by his former supporter, the Archbishop of Pisa. Dragged from his palace, 1st July 1288, after a desperate defence, he was thrown into the tower of Gualandi, with his two sons and two grandsons, where they all perished amid the agonies of starvation, for which reason their dungeon has since borne the ominous name of the 'Tower of Hunger.' In spite of this, the family again rose into importance; and in 1329 we find *Nieri Donavatico G.* at the head of the republican authority in Pisa. See Sismondi's *History of the Italian Republics.*

GHI'BELLINES. See GUELPHS AND GHIBELLINES.

GHIBE'RTI, LORENZO, a famous Italian sculptor, was born at Florence about 1378. He was educated in art by his stepfather, a skilful goldsmith, and rapidly acquired dexterity in drawing, painting, and modelling. At the age of 19, he was selected for the execution of a noble fresco in the palatial residence of Prince Pandolfo Malatesta at Rimini. Along with seven other artists, he was next chosen by the Florentine guild of merchants to compete for the execution of a splendid gate in bronze, to suit that executed by Andrea Pisano in the baptistery of Florence, about 1340. The subject of the design was *The Sacrifice of Isaac*, to be executed in bas-relief as a model for one of the panels. The judges found a difficulty in deciding between Brunelleschi, Donatelli, and G., but the two former generously proclaimed the superiority of G.'s design, both with respect to the art and beauty of its conception, and the delicacy and skill of its execution. When G. had completed his great work, his fellow-citizens intrusted him with the execution of another gate, to emulate the beauty and colossal dimensions of the two already adorning the baptistery. From Michael Angelo, G. received a noble tribute of admiration, when the great artist asserted that *the two gates were worthy of Paradise*. G.'s second gate contains ten reliefs on a larger scale, the subjects in this case also being wholly biblical. The mingled grace and grandeur of these compositions are beyond all praise. Not the least of G.'s merits was the success that attended his efforts to break up the conventionalism that before his day hampered the free development of sculptural art. Among his other works may be mentioned a bronze relief in the Duomo at Florence, representing San Zenobi bringing a dead child to life, and bronze statues of St John the Baptist, St Matthew, and St Stephen. G. died at Florence in 1455.

GHI'KA, a princely family of Albanian origin, which has given many hospodars to Moldavia and Wallachia. The founder of the House was George G., an Albanian by birth, who, through the favour of his compatriot, the grand vizier, Mohammed Kiupruli, was raised to the dignity of Hospodar of Wallachia in 1657. He was succeeded by his son Gregory G., who ruled, with various vicissitudes, till 1673, and received from the Emperor Leopold I. the title of Prince of the Holy Roman Empire. Of subsequent members of the family, the only ones calling for special notice are Alexander, Gregory, and Helena.

ALEXANDER GHIKA IX. was born in 1795, and, through the influence of the Russian Count Kisseleff, was elevated to the hospodarat of Wallachia in 1834. Nevertheless, he soon exhibited liberal and enlightened tendencies. He founded schools for primary instruction in every village, lightened the burdens of the peasantry, commenced the enfranchisement of the gipsies, and assisted in the organisation of a national party, since known as *Young Roumania*. Russia naturally took the alarm, and gradually, under her influence, a twofold opposition was excited against him, viz., an opposition of the extreme liberals, and also of the old boyards (the landed proprietors), who formed the Tory party, and were his personal enemies; the result of which, after many intrigues and plots, was that, in 1842, he was ordered to resign his dignity by the Turkish sultan. He now betook himself to Vienna, where he lived quietly till 1853, when he returned to Wallachia, to find himself once more popular; and in 1856 he was elected 'Caïmacam' of the principality, to the great joy of the young Roumanian party both in Moldavia and Wallachia.

GREGORY GHIKA X., hospodar of Moldavia, born at Botochani, in Moldavia, 25th August 1807, was appointed *Hetman*, or commander-in-chief of the militia, in 1826, Secretary of State in 1842, and Minister of Finance in 1843, under the hospodarat of Michael Stourdza. But as the system of the government became more and more Russian in its character, he resigned his functions, and passed into the ranks of the liberal opposition, of which he soon became one of the chiefs. In 1849, the sultan appointed him hospodar, in order to counteract the influence then exercised by Russia in the adjoining principality. His tenure of office may be divided into three distinct periods. In the first, his efforts at reform were crippled by the presence of Russian troops in the Principalities, in violation of the convention of Balta-Liman. The second, commencing with the departure of the Russians in 1851, was marked by many excellent measures; he organised a good police system, augmented the effective force of the militia, founded schools for superior and secondary instruction at Niamtzo, Houch, Galatz, &c., promulgated an administrative code—the first great step towards the reform of abuses—increased municipal resources, and at his own expense built aqueducts, and printed important historical MSS. The re-occupation of the Principalities by Russia in 1853 suspended his labours, and resigning the hospodarat provisionally, he withdrew to Vienna, but resumed his functions in the end of the following year. The third period of G.'s rule was initiated by the formation of a liberal ministry, by the support of which he effected, among other things, a radical reform of the penitentiary system, the abolition of serfdom (1855), and of the censorship of public journals (1856), and the establishment of foreign merchant companies for the navigation of the Pruth and the Sereth (1856); while he also encouraged the growth of a union feeling among the Roumanian party in both principalities. His tenure of office expiring in 1856, G., whose private fortune had been rather diminished than increased by his dignity, quitted Moldavia, and went to reside in France. His death occurred in the end of July 1857.

HELENA GHIKA, Princess *Koltzoff-Massalsky*, better known by her literary pseudonym of *Dora D'Istria*, is niece of Prince Alexander Ghika, ex-hospodar of Wallachia, and was born at Bucharest, 22d January 1829. Profoundly instructed in the classics under the care of George Pappadopoulos, she added to these, by frequent travels through Germany, France, and Italy, an extensive knowledge of modern languages and literature, and at the age of 15 commenced a translation of the *Iliad* into German, and not long after wrote several pieces for the theatre. On her marriage with Prince Koltzoff-Massalsky, who belonged to one of the oldest Russian families, she accompanied her husband to the court of St Petersburg. Since 1856, however, she has fixed her residence at Aarau, in the canton of Aargau, in Switzerland, and devotes herself wholly to literary labour. Her first important work, *La Vie Monastique dans l'Eglise Orientale*, was published at Paris and Geneva in 1855. This was followed by two works written in Italian, *Gli Eroi della Rumenia* (The Heroes of Roumania) and *I Rumeni ed il Papato* (The Roumans and the Papacy). Her studies in Switzerland have also resulted in a volume entitled *La Suisse Italienne*. Besides these, she has also contributed largely to various foreign reviews. Her religious writings are marked by a pious faith in the great doctrines of Christianity, an indifference to outward forms, and a tendency to mysticism, while her political opinions are liberal to a degree that scandalised the court of St Petersburg during her residence there.

GHILA'N, a border province of Persia, consists of the south-western portion of the narrow strip of country lying between the Elburz range and the Caspian Sea. It extends between lat. 36° 30′ and 38° 30′ N., and long. 48° 33′ and 50° 30′ W. It is upwards of 150 miles in length, and about 70 miles at its broadest part. The province is subject, from the lowness of the land, to frequent inundations, and indeed during greater part of the year is little better than a swamp. Forest and mulberry trees, with some rice, are grown. Its extent in square miles, and its population, have not yet been ascertained. The climate is unhealthy.

GHIRLANDAJO, or CORRADI, DOMENICO, an eminent painter of the early Florentine school, was born at Florence in 1451. From his youth, he was educated to the craft of the goldsmith by his father, who received the name of Ghirlandajo on account of his being the inventor of some silver ornaments of great elegance, in the form of a wreath or *ghirlanda*, which became the favourite head-dress of the Florentine beauties of his day. At the age of 24, G. abandoned working in gold, and set about qualifying himself for the calling of a painter. He lived to become not only a famous and lauded artist, but also one of the most progressive and original masters of his age. His greatest works are frescoes, but he has also left fine easel paintings, both in oil and distemper, and his composition in mosaic—or 'eternal painting,' as he termed it—are unrivalled for the brilliant dyes of the colouring and the delicate softness with which they are blended and graduated. The Capella di Sassetti, in Florence, contains a noble series of G.'s frescoes, illustrative of both historical and legendary incidents in the life of St Francis. They are strongly characterised by the wonderful mastery of intense and varied human expression, which, more than accurate delineation of form, was the great merit of G.'s paintings. The Church of Santa Maria Novella is also rich in this artist's works, being adorned by a set of frescoes representing scenes from the life of St John the Baptist, many of the figures introduced being correct likenesses of some of the leading celebrities of the day. G. was the first artist who adopted correct principles of perspective, just gradations of shade and form, and dramatic art in grouping. G. died at the early age of 44, in the year 1495.

GHIUSTENDI'L, a town of European Turkey, in the eyalet of Rumili, is situated on the slope of a hill about two miles distant from the right bank of the Struma or Kara Su, 192 miles in direct line west-north-west of Adrianople. It is surrounded by an old wall flanked with towers, is the see of a Greek bishop, and contains a bazaar and sulphurous baths. Pop. 10,000.

GHI'ZEH, or **GIZEH** (Coptic, *Tpersioi*), a village in Egypt, close to the northern border of Middle Egypt, on the opposite side of the river and about three miles west-south-west from Cairo. In the immediate vicinity, the line of great pyramids commences. See PYRAMID. Here one may still witness the process of egg-hatching in ovens, a practice which has been continued from the time of the Pharaohs to the present day. G., formerly adorned with beautiful palaces and mosques, the pleasant retreat of the Cairo merchants, is now a mere village, and mounds of rubbish are almost the only indication that buildings of some pretension once existed here.

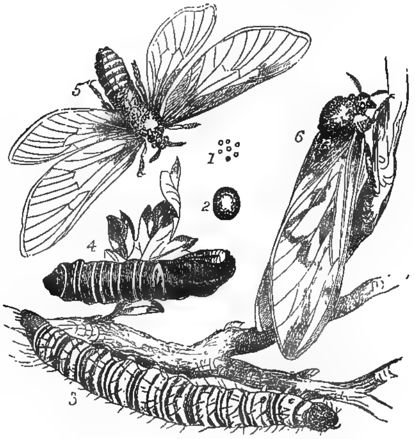
GHI'ZNEVIDES, a celebrated dynasty, which, in the height of its power, possessed an empire extending from the Tigris to the Ganges, and from the Sihon or Sir-Daria to the Indian Ocean. The founder of the dynasty was Alepteghin, originally a slave belonging to Abdulmelek, the Samanî Ameer of Bokhara, who was appointed governor of Khorassan; but on the death of his benefactor he rebelled, and proceeded at the head of an army to Ghizni, of which he took possession in 961, and for 15 years successfully withstood the whole power of the Samanî (q. v.). On his death, Sebekteghin or Sabactagî was unanimously chosen as his successor. He was distinguished for his prudence and valour, and equally so for his humanity and justice. By him the kingdom was extended from the Indus to Khorassan, and from the Gulf of Oman to the Amû-Daria or Jihon; and in the latter province his son, Mahmûd, was appointed governor under the nominal suzerainty of the Samanî. Sebekteghin died in 997, and was succeeded by his younger son Ismâil; but Mahmûd the elder, hearing of his father's death, hastened to Ghizni, and assumed the reins of government in 998, with the title of Sultan. In the year following, he took complete possession of Khorassan, and in 1001 commenced a series of destructive inroads into Hindûstân. Falling in with Jeypâl, the prince of North-Western India, at Peshawur, Sultan Mahmûd, on the 8th of Mohurrim (November 26), defeated him with immense slaughter. In 1004, while on his second expedition to India, he was recalled by the news that Eylek Khân of Khashgar, who in 999 had conquered the Samanî and taken possession of their territory, was ravaging Khorassan and Balkh; on hearing which, Sultan Mahmûd, leaving his conquests, returned in an incredibly short time to Ghizni, and thence proceeding without delay to Balkh, engaged in battle with the enemy, and completely defeated them. He then took possession of the country between the Sihon and the Jihon (ancient Transoxiana). In 1007 and 1009, Sultan Mahmûd made his third and fourth expeditions into Hindûstân, and each time carried off an immense booty in money, jewels, and slaves. On his return to Ghizni, he made a liberal distribution from his treasures among the poor and the ministers of religion. About this time he reduced Ghûr, Gherjistân, and Khaurezm, bestowing the latter province upon Altun-Taush, one of his favourite generals. In 1024, he was engaged in his last expedition against the Hindûs, the famous expedition to Somnaut (q. v.), at the southern extremity of Guzerat. Mahmûd here obtained an enormous booty. In 1027, he received from the Calif Ul Kader a ratification of all his conquests, together with numerous titles of honour, and in the two following years having conquered Irak, Tebriztân, and Mazanderan, he returned to his capital, where he died on the 29th of April 1030. At this time, the empire of Ghizni was at the summit of its glory, having in the short space of 69 years extended over 38 degrees of longitude and 20 of latitude. Mahmûd possessed some of the most exalted qualities that dignify and adorn human character, but they were much obscured by his sanguinary zeal for the advancement of Islam. He was succeeded by his younger son Mahomed, who in October of the same year was compelled to resign the sovereignty to his elder brother, Mussaûd I. This prince was in 1037 signally defeated by the Seljûks (q. v.), who had taken possession of Khorassan under Toghrul Beg and Tchegher Beg, the grandsons of Seljûk. Though an able and warlike prince, misfortunes crowded thickly round his declining years, and in 1041 he was put to death. During his reign, the Seljûks took possession of Bâlkh, Khorassan, Khaurezm, Herât, and Irak. The sovereigns who in succession reigned in Ghizni were Mûdud (1041—1049), Mussaûd II. (1049), Ali (1049—1052), Abdurrashîd (1052—1053), and Furrukhzaud (1053—1058), during whose reigns there is nothing worthy of relation, beyond the intestine quarrels at Ghizni, and the encroachments of the Seljûks on the west and north. The reign of Furrukhzaud, however, shed a bright lustre over the expiring glory of Ghizni, for the Seljûk prince, Daoud, thinking to take advantage of the dissensions at Ghizni, marched towards it; but on the way he was met by Nûshtekein, one of the best generals of the age, and signally defeated. Taking advantage of this victory, Nûshtekein marched into Khorassan, to recover that province, and encountering Kellisaurek, a celebrated Tûrkman chief, totally defeated him. On news of this second defeat, Alp-Arslan (q. v.) was sent by his uncle Toghrul Beg to stop the progress of the G.; and in the battle which ensued, fortune changed sides, and Nûshtekein was totally defeated. A treaty of peace was then concluded. Furrukhzaud was succeeded by Ibrahim (1058—1098), Mussaûd III. (1098—1114), Arslan Shah (1114—1118), and Behram Shah (1118—1152). During the reign of this last prince, the Ghûri, a tribe inhabiting the mountainous country of Ghûr, began to make inroads upon the territory of Ghizni, and growing bolder by success, attacked and took the capital itself, driving Behram Shah across the Indus. But on the retreat of part of the Ghûri to their own country, Behram Shah returned and retook his capital, making prisoner the Prince of Ghûr, Seyfuddeen Souri, whom he put to death with the most refined cruelty. On learning this, the brother of the unfortunate prince, Allah-ud-deen, hastened from Ghûr, and having defeated Behram Shah, gave up Ghizni to be pillaged by his followers. Behram Shah, thus driven a second time across the Indus, desisted from all further attempts to regain his ancestral dominions, and died in 1152. His son Khosrû Shah succeeded him, and took up his residence in Lahore; but the many attempts which he made to repossess himself of Ghizni and the surrounding territory were unsuccessful. Khosrû Melek, the seventeenth and last monarch of the dynasty of Ghizni, occupied himself in the first part of his reign (1160—1166) in extending and consolidating his Indian possessions, but subsequently his whole energies were required to repel the attacks of Shahab-ud-deen Mahommed, Prince of Ghûr, who, having conquered all the territory west of the Indus, now sought to drive the race of Sebekteghin from their last possession. In 1184, Lahore was all that remained to Khosrû Melek, and the taking of that city by the Ghûrian prince in 1186 put an end to the power of the Ghiznevides.

GHI'ZNI, a river of Afghanistan, loses itself, after a southerly course of about 80 miles, in the salt lake of Abistada, which is 7076 feet above the sea. Its source is 12 miles to the north of the city of its own name, and its mouth is about lat. 32° 35′ N., and long. 68° E. Its embankments, dating from the 11th c., are still fit for the purposes of irrigation.

GHIZNI, the city mentioned in the preceding article, stands at an elevation of 7726 feet, on a scarped rock, which rises 280 feet above the adjacent plain. Its natural strength has been increased by walls of 35 feet in height, and a wet ditch. It has long been a place of importance in Central Asia, having been, in the 11th c., the seat of an empire (see Ghiznevides). Some of the most interesting points in its history, however, are much more recent. In the July of 1839, G. was stormed by the British under Lord Keane; and in 1842 it was first surrendered to the Afghans, and then retaken by General Nott. Eventually it was restored, with the rest of the country, to Dost Mohammed. It is situated in long. 68° 18′ E., and lat. 33° 34′ N.—a parallel which, under the influence of the remarkable altitude of the spot, yields, in winter, a temperature of about 20° Fah. below zero. The population has been variously estimated up to 10,000, fluctuating most probably with the season of the year. G. is an entrepôt of the trade between Afghanistan and the Punjab.

GHO'GRA, or **GHAGRA**, one of the largest affluents of the Ganges, joins that river from the left in lat. 25° 46′ N., and long. 84° 40′ E., after a generally south-east course of 600 miles. It rises in lat. 30° 28′ N., and long. 80° 40′ E., on the southern declivity of a mountain-range, which separates the district of Kumaon from South-West Thibet. The actual source, being between 17,000 and 18,000 feet above the sea, is hidden under perpetual snows at every season, while in winter it can scarcely be said to flow at all. Throughout the first 50 miles, the torrent, tumbling as it does down deep gorges, is in many places entirely concealed by glaciers. After receiving many tributaries on both sides, it enters the great plain of Hindustan in lat. 29° 6′ N., and long. 80′ 13′ E., being now, after a run of 148 miles, 798 feet above the sea. Here it has been estimated to be about two-thirds of the size of the Ganges at the corresponding point of Hurdwar. Hitherto it has generally formed the boundary between Kumaon and Nepal. Before the G. has descended 70 miles further, it has become navigable for craft of considerable burden. Further down, it is practicable for boats of all sizes at every season, but is here and there beset by dangerous and intricate shoals. Like other great rivers traversing alluvial tracts (see Ganges), it sends off lateral water-courses, which in the rainy season communicate with the parent-flood and with each other. The principal auxiliaries, to take them in order, are the Kalipani on the left; the Dhouli, on the right; the Gorigunga, also on the right; the Chumalea, on the left; the Western Surju, on the right; the Lohogatalu, on the right; the Ladhia, the last of its hill-tributaries, also on the right; the Kurnalli, on the left; the united Chonka and Woel, on the right; the Eastern Surju, on the left; and finally, the Rapti, also on the left.

GHOST-MOTH (*Hepialus humuli*), a species of moth very common in many parts of Britain, and of which the caterpillar—popularly known as the Otter—often commits great ravages in hop plantations, devouring the roots of the hop. It feeds also on the roots of the nettle, burdock, and some other plants. This moth belongs to a family (*Hepialidæ*) often popularly called *Swifts* from their rapid flight, having long narrow wings, and destitute of a tongue. The antennæ are short. The male G.-M. is entirely of a satiny white colour above; the female yellowish with darker markings; both sexes are brown on the under side. They are to be seen flying about in the twilight, generally over lawns and pastures, not unfrequently in churchyards, from which circumstance, and from the white colour of the males and their sudden disappearance in the imperfect light on their folding their wings, or rising above the level of the spectator's eye so that the brown part is turned towards him, they derive their name. The caterpillar is yellowish white, with scattered hairs, sometimes nearly two inches long. It spins a large cylindrical cocoon among the roots on which it has been feeding, and there becomes a chrysalis.



Ghost-Moth (*Hepialus humuli*):
1, eggs, natural size; 2, the same, magnified; 3, larva or caterpillar; 4, chrysalis; 5, imago or perfect insect, male; 6, the same, female.

GHOSTS. See Apparitions.

GHUMURDJI'NA, or **KOMULDSI'NA**, a town of European Turkey, in the eyalet of Rumili, is situated on the right bank of the Karadji, about 80 miles south-west of Adrianople. It has extensive bazaars and a small citadel, and is supposed to contain about 8000 inhabitants.

GHÛR, or **GHORE**, a mountainous district of Western Afghanistan, lying south-east from Herât. It was conquered by the famous Sûnní hero, Mahmûd of Ghizni (q. v.), and about three centuries afterwards was overrun by Genghis Khan, who almost completely exterminated the ancient inhabitants. It is celebrated in history as having been the original possession of the princes who established the second Mohammedan dynasty in Hindûstân. It is inhabited at the present day by the independent nomad Tartar tribes of the Hazâreh and Eimâk, principally the latter.

GHÛRI, or **SULTANS OF GHÛR**, were a race of princes who had the seat of their empire in the country of Ghûr (q. v.), and ruled over Persia, Northern Hindûstân, and Transoxiana. The first of this family mentioned in history is Sûri, who opposed an obstinate but unavailing resistance to Sultan Mahmûd of Ghizni. One of his descendants, named Husseyne, was subsequently appointed governor of Ghûr, in which office he was succeeded by his sons. But Behram Shah having put to death one of the brothers, the others threw off their allegiance to the race of Sebekteghin, and hostilities ensued (see GHIZNEVIDES), in which the eldest brother, Seyf-ud-deen, was killed, and his brother Allah-ud-deen, surnamed Jehaun-souz (the Conflagrator), succeeded to the sovereignty. After subduing the sultan of Ghizni, Allah-ud-deen invaded Khorassan, but was defeated and taken prisoner by Sultan Sunjur the Seljûk. He was succeeded by his son Mahommed in 1160, who was assassinated at the end of the first year of his reign. Gheiatheddin Mahommed ascended the throne in 1161, and after a long and bloody contest with the Khaurezmians, succeeded in obtaining possession of Khorassan. During his reign the affairs of Ghizni were committed in charge to his brother, Shahab-ud-deen Mahommed, who, having subdued the Ghiznevide provinces west of the Indus, crossed that river and conquered successively the provinces of Mûltan (1176), Lahore (1186), and Ajmere (1190), defeating the rajah of Ajmere's army numbering 300,000 horse and 3000 elephants, and in the course of the next six years conquering Hindûstân as far south as Nagpûr, and westward to the Irrawady. It is from this epoch that the preponderance of Islam in Hindûstân is dated. Shahab-ud-deen succeeded to the throne in 1203, on the death of his brother (see GHIZNEVIDES). The house of Ghûr had now reached its acme of power, their territory extending from the Caspian Sea to the Bay of Bengal, and from the Jihon to the Indian Ocean. Shahab-ud-deen, having invaded Khaurezm in 1204, was attacked by the sultan of that country, and completely routed. In the following year, he undertook an expedition into Kojud, on the south border of Cashmere, in order to reduce that rebellious province, in which undertaking he obtained complete success, but on his return was assassinated by one of the Fedayan, or followers of Hussun Sabah, in 1206. His nephew, Mahmûd, succeeded; but after a short reign of four years was assassinated. After his death, some members of the family made feeble efforts to revive the grandeur of their ancestors, but as the sultans of Khaurezm had by this time subjugated the whole Persian empire, their attempts were fruitless.

GIANIBE'LLI, or **GIAMBELLI**, FEDERIGO, a famous military engineer, was born at Mantua about the year 1530. After serving for some time in Italy, he proceeded to Spain and offered his services to Philip II.; but having failed to obtain an audience of that monarch, and conceiving, moreover, that he had been personally slighted, he abruptly quitted Madrid, swearing, as the story goes, that the Spaniards would yet hear of him; and after a residence for some time at Antwerp, where he acquired a high reputation as a mechanist, passed over to England and entered the service of Queen Elizabeth, who granted him a pension. During the War of Independence in the Netherlands, Alexander, Duke of Parma, generalissimo of the Spanish forces, besieged Antwerp in 1585, whereupon Elizabeth commissioned G. to proceed to the assistance of the inhabitants. On his arrival, he found that the Spaniards had built a vast bridge across the Scheldt, interrupting all communication with the sea, by which alone the city could get provisions or help. Setting his wits to work, G. invented an infernal machine, which he launched against the bridge one stormy night. The effect was frightful. The whole Spanish army was roused by the noise, and the Scheldt was found to be quivering to its lowest depths. The obstructing bridge was blown into the air, and no less than 800 men—among whom were some of the best Spanish officers—were killed. Many Spanish ships also were either burned or sunk. The want of unity, however, among the citizens, ultimately rendered G.'s aid unavailing, and he was obliged to return to England. Here he was employed at the time of the threatened Spanish invasion in fortifying the coast-line, which he did in a very skilful manner. When the Armada appeared in the Channel, it was G. who proposed and carried out the plan of sending fire-ships into the midst of the enemy, and in this way greatly contributed to their defeat. After this he disappears from history, and all we know of him is that he died in London.

GIANNO'NE, PIETRO, an eminent historian and lawyer, was born, 1676, at Ischitella, a village of Capitanata, in Naples. He early distinguished himself as an able and learned practitioner at the bar of Naples, and soon realised an easy independence, which enabled him to devote his time and energies to his favourite historical researches. In his beautiful villa, adjoining Naples, he laboured during the space of twenty years at his greatest historical work, which, in 1723, he published in four volumes, under the title of *Storia Civile del Regno di Napoli.* This valuable and comprehensive work, not only treats of the civil history of the kingdom, but also contains learned and critical dissertations on the laws, customs, and administrative vicissitudes of Naples from the most remote times, tracing the successive working of Greek, Roman, and Christian influences on the legislative and social institutions. Some severe strictures on the spirit of worldly aggrandisement, and progressive corruption of the doctrines and practices of primitive Christianity apparent in the modern Roman Catholic Church, so enraged the ecclesiastical party, that G. was universally denounced and anathematised from pulpit and altar. The ignorant fanaticism of the lower classes was aroused by the grossest calumnies levelled at the great writer, who was finally forced to yield before the tempest and take refuge at Vienna. The history was solemnly condemned as heretical and libellous by the pope, and was strictly prohibited. G. was granted a small pension by the Emperor Charles VI., under whose dominion Naples then was, and received, in some degree, compensation for his sufferings, in the admiration and sympathy of the enlightened spirits of his own land. In 1734, G. was deprived of his pension and returned to Venice, from whence he was expelled and forced to seek shelter in Geneva. There he composed his famous and bitterest diatribe, entitled *Il Triregno*, against the papal pretensions, and even proclaimed his adoption of the Calvinistic doctrines. Shortly after, an emissary from the court of Turin, having artfully ingratiated himself into the confidence of G., induced him to enter the Sardinian states, where he was immediately arrested and conducted to the fortress of Turin a close prisoner. G. beguiled his tedious confinement with his chosen studies, and retracted his change of religious opinions, a step which in no way alleviated his persecution. He died a prisoner in the fortress, in 1748, after an incarceration of twelve years. His son, Giovanni, was assigned a liberal pension by the new king of Naples, Don Carlos of Bourbon, who thus sought to avert from his house the reproach which overwhelmed the persecutors and jailers of one of Italy's most illustrious citizens. *La Storia Civile* has passed through several editions, the most modern is that of Milan, 1823, in 13 vols., 8vo. See *Corniani; Vita di P. Giannone da Leonardo Panzini; Storia della Letteratura Italiana da Maffei.*

GIANTS AND DWARFS. A giant (from the

Greek word *gigas*) is an individual whose stature and bulk exceed those of his species or race generally.

Until the beginning of the present century, it was universally believed that giants, of a size far exceeding those who are exhibited in our times, formerly existed, either as nations or as individual specimens. This belief was based (1) on the asserted discovery of colossal human bones; (2) on supposed scriptural evidence; and (3) on the evidence of various ancient and medieval authors.

A reference to the first volume of Cuvier's *Ossements Fossiles* will shew that the bones of elephants, rhinoceroses, mastodons, &c., have been exhibited and accepted as evidence of pre-historic giants. Even so good a naturalist as Buffon fell into this popular delusion, and figured the bones of an elephant as the remains of human giants. Isidore Geoffroy Saint-Hilaire, in his *Histoire des Anomalies de l'Organisation*, notices several of the most famous of these cases. A gigantic skeleton which was found at Trapani, in Sicily, in the 14th c., was at once pronounced to be that of the classical giant Polyphemus, and his height was calculated at 300 feet. It was pointed out that the bones differed in form as well as in size from those of man, but this objection was easily met by the question: Why, if his height was sixty times as great as that of an ordinary man, should not his form be also different? Many less celebrated giants were subsequently exhumed in Sicily, and the existence of the 'Osseous Caverns,' described by De Quatrefages in his *Rambles of a Naturalist*, fully accounts for such discoveries, at an epoch when few could recognise the differences in form between the bones of an elephant and those of man. Passing over a giant whose bones were exposed by the action of the Rhone in 1456, and whose height was estimated at 30 feet, and another whose skeleton was discovered near Lucerne in 1577, and who, according to the calculation of the learned physician Plater, did not exceed 19 feet, we come to the case of King Teutobochus, whose remains were discovered near the Rhone in 1613, by a surgeon named Mazurier, whose *Histoire Véritable du Géant Teutobochus* (1618) gave rise to a warm controversy. The anatomist Riolan endeavoured to expose the imposture, but the Parisians rushed in crowds to see the mastodon's bones, which were reported to have been found in a tomb 30 feet long, bearing the inscription 'Teutobochus Rex.' Nor have our own countrymen been less credulous than their continental neighbours. In 1712, Dr Mather, in the *Philosophical Transactions*, announced the discovery of enormous bones and teeth which had been found in the state of New York, and which he regarded as affording evidence of the existence of giants of enormous size in ancient times. The bones were in reality those of a mastodon.

The Scripture evidence, when carefully examined, does not amount to much. The Hebrew words *nephilim* and *giborim*, which occur several times in the Book of Genesis, and which are translated *giants*, might as well be translated *bearded, cruel,* or *violent men.* The height of Og, king of Bashan, is not given; we are only told the length of his bed; and excluding his helmet, which was probably taken into account in the recorded measurement, Goliath, at most, did not exceed eight feet and a half in stature, and consequently was not taller than some giants of modern days.

The classical evidence is abundant, but obviously untrustworthy. Thus Plutarch relates that Serbonius had the grave of Antæus, in the city of Tungis, opened, and 'finding there his body, full 60 cubits long, was infinitely astonished, ordered the tomb to be closed, gave his confirmation to the story, and added new honours to the memory of the giant.' Pliny reports that an earthquake in Crete disclosed the bones of a giant 46 cubits in length, who was held by some to be Orion, and by others Otus. Descending to more certain evidence, there is no doubt that a height of between 8 and 9 feet, and probably of more than 9 feet, has been attained. There is a skeleton in the Museum of Trinity College, Dublin, 8 feet 6 inches in height; that of O'Brien (or Byrne), in the Museum of the College of Surgeons of England, is 8 feet 2 inches; and that of a giant in the Museum at Bonn is 8 feet; and the actual body with the soft parts attached was probably two or three inches longer than the skeleton. (O'Brien, for example, measured 8 feet 4 inches after his death, as we find recorded in the *Annual Register*, vol. xxvi. p. 209.)

We commonly apply the term *Dwarf* to any organised being, but especially to individuals of the human species, whose height is much less than the average height of their race. Strictly speaking, however, the word should be restricted to those cases in which there is a general and uniform arrest of growth, except, perhaps, in the nervous system, which is often fully developed in dwarfs.

The ancients believed not only in dwarfs of extreme minuteness, but in nations of them. Aristotle, the greatest naturalist that perhaps ever existed, declared that the report of trustworthy witnesses testifies to the existence of a minute race of men, with minute horses, living in the caves which are washed by the waters of the Nile; and Pliny gives various details regarding their habits and their geographical position. Amongst the extreme cases recorded on ancient authority, we may notice that of Philetas, a poet who was a contemporary with Hippocrates, and who was obliged to ballast himself, to avoid being blown away by the wind; that of the Egyptian dwarf mentioned by Nicephorus Calistus, who, at the age of 25 years, did not exceed a partridge in size; and lastly, that of the poet Aristratus, of whom Athenæus records that his stature was so small that *no one could see him.*

We shall now briefly notice a few of the most remarkable dwarfs of modern times. All the readers of *Peveril of the Peak* are acquainted with Sir Geoffrey Hudson. Up to the age of 30, his height was only 18 inches; from that age, he rapidly grew to the height of 3 feet 9 inches. He had an enormous head, and large hands, but in other respects was well proportioned. He died at the age of 63. Count Joseph Borowlaski was the son of well-formed healthy parents of the ordinary size, who had six children, of whom the first, third, and fifth were dwarfs. Joseph, who wrote a history of his own life, records that his eldest brother was 3 feet 6 inches high; then came a son who was 5 feet 10 inches; then came Joseph himself, whose height at 20 was 2 feet 4 inches, and at 30, 3 feet 3 inches. He was succeeded by three others, the middle one being a girl, who died at 22 of the small-pox, being then 2 feet 2 inches, but of admirable proportions. Joseph Borowlaski was very well proportioned, was married to a woman of ordinary size, who brought him several well-formed children, and died at Bank's Cottage, near Durham, in 1837, at the age of 98—a great age for an ordinary man, and without example in the history of dwarfs. Nicholas Ferry, commonly known under the name of Bébé, was another celebrated dwarf. His parents and his brothers and sisters were all well-formed persons. He was a seven months' child, and at birth measured less than eight inches, and weighed less than a pound. When five years old, a physician, who examined him, reported that he then weighed

9 pounds 7 ounces, and stood 22 inches high, but was formed like a young man of 20. He died in his 23d year, being then under three feet high. (Humphry, *On the Human Skeleton*, p. 101.) In the Museum of the Faculté de Médecine of Paris, there is a wax-model which represents him at the age of 18; and in the Muséum d'Histoire Naturelle is his skeleton, which in the complete ossification of the bones, and in the disappearance of the cranial sutures, resembles that of an aged person. According to C. G. Carus (*Symbolik der menschlichen Gestalt, Zweite Auflage*, 1858, p. 83), General Tom Thumb, the well-known dwarf, exhibited about twelve years ago in this country, was 25 inches in height, and weighed 25 pounds; and Prince Colobri, a Slesvig dwarf, who was being exhibited in Dresden in 1851, was of a similar height and weight, his age being 21 years. Carus likewise examined, in the year 1857, a Dutch dwarf, who took the name of Tom Thumb. He was aged 18 at the time of the examination, and then measured about 2 feet 4 inches. (These are probably Prussian measures, which slightly exceed those of this country.)

On comparing the *data* in our possession regarding giants and dwarfs—and for most of these *data* we must refer the reader to Geoffroy Saint-Hilaire's *Histoire des Anomalies*—it appears (1) That giants are of rarer occurrence than dwarfs: (2) That giants are usually of a lymphatic temperament, and of a very delicate complexion, often deformed, and almost always badly proportioned; that their muscles are flabby, and their voice weak; while dwarfs are often perfectly well proportioned, and are strong for their size: (3) That giants are never long-lived—O'Byrne died at 22, Magrath at 20—while dwarfs seem to attain the full ordinary period of human existence—Borowlaski died at 98, Hudson at 63; and although we do not know the age at which Therese Souvray—a dwarf described by Virey—died, we know that at the age of 73 'elle était encore vive, gaie, bien portant, et dansait à la mode de son pays:' (4) That while giants usually exhibit a want of activity and energy, and are feeble both in body and mind, dwarfs are in general lively, active, and irascible (Borowlaski in his memoirs gives a good illustration of the last characteristic, as exhibited by the dwarf Bébé: 'When he perceived that the king took pleasure in my society, he conceived the most violent jealousy and hatred of me . . . . and endeavoured to push me on to the fire;' and Sir Geoffrey Hudson's irascibility is well depicted in *Peveril of the Peak*). That the intellectual power of dwarfs is sometimes considerable, is sufficiently evidenced in the cases of Borowlaski, General Tom Thumb, and the Dutch Tom Thumb, who, according to Carus, spoke four languages.

We know little of the causes which occasion the excessive development or the arrested growth on which the production of giants and dwarfs depends. Bishop Berkeley* is said to have attempted with considerable success to manufacture a giant. He took a poor orphan, named Magrath, and reared him on certain hygienic principles (Virey conjectures that he fed him with mucilaginous foods and drinks, but nothing seems known on this point), which were so far successful that, at the age of 16, he was 7 feet in height, and that at the time of his death, which occurred, with all the symptoms of old age, at the age of 20, he was 7 feet 8 inches high. If food in this case did really produce a giant, why cannot our farmers be as successful as the bishop? They can only produce fatty monstrosities, not giants.

Geoffroy Saint-Hilaire devotes a special section of his book to 'the causes of dwarfism,' but he only arrives at the general conclusion, that in these cases there is an obstacle to the proper nutrition and development of the fœtus; that this obstacle may be due either to something wrong in the maternal organism, or more commonly to some disease affecting the fœtus itself; and that this disease is usually rachitis or rickets.

Mythological Giants and Dwarfs.—Giants play a part in the mythology of almost all nations of Aryan descent. The Greeks, who represented them as beings of monstrous size, with hideous countenances, and having the tails of dragons, placed their abode in volcanic districts, whither they were fabled to have been banished after their unsuccessful attempt upon heaven, when the gods, with the assistance of Hercules, imprisoned them under Ætna and other volcanoes. Their reputed origin, like the places of their abode, points to the idea of the mysterious electrical and volcanic convulsions of nature, which they obviously typify; and, in accordance with this view, they are said to have been of mingled heavenly and earthly descent, and to have sprung from the blood that fell from the slain Ouranos upon the earth, Ge, which was their mother. In the cosmogony of the northern nations, giants occupy a far more important place than the Greeks assigned to them, for here the first created being was the giant Ymir, called also 'Aurgelmir,' or 'the ancient Chaos,' the progenitor of the Frost-giants (Hrimthursar), among whom dwelt the All-Father before the creation of heaven and earth. The mode of origin of Ymir was as follows: In the beginning of time a world existed in the north, called Niflheim, in which was a well, Hvergelmir, from whence issued a poisonous stream which hardened into ice, the accumulation of which formed the northern part of Ginnungagap, or abyss of abysses, whose southern extremity was radiant with the heat and light which emanated from another world, known as 'Muspelheim.' The meeting of heat and ice produced drops, which, through the agency of the same creative power (the All-Father) which had sent them forth, received life and a human form. This was Ymir, who was nourished from four streams of milk, which flowed from the cow Audhumla, or the nourishing-power, which had been created by Surt, the guardian watch of Muspelheim. While Ymir slept, a man and woman grew from under his left arm, and a son was produced from his feet. In course of time, other beings were generated from the salt and frost-covered stones which the cow Audhumla licked, and from these were born three brothers, Odin, Vili, and Ve, who were gods, and who, having slain Ymir, and dragged him out into the middle of Ginnungagap, formed from his blood the sea and all waters, and from his huge body heaven and earth and all solid things in nature.

With Ymir perished all the frost-giants except Bergelmir, who, with his wife, escaped on a chest or drum, and became the father of the new giant dynasty of the Jötuns. The gods formed, however, of the eyebrows of Ymir, a wall of defence against these giants, who thenceforward dwelt in Jötunheim, beyond the boundaries of the ocean, which encircled Midgard, the future abode of the sons of men. The Æsir or gods lived in their own city, Asgard, occupying themselves with works of industry till they were corrupted by the giantesses who came to them from Jötunheim, when the Golden Age ceased, and discord arose among the gods. At the instigation of the maidens from Jötunheim, the gods created dwarfs and men; the former from the maggots generated within the body of Ymir, and the latter from trees; and from this time the giants gradually lost their power, under the united opposition of gods and men. In the popular belief, common in all countries, that through the agency of giants mountains and islands have arisen, and rocks and mountains have been hurled from their original sites, we trace the ideal personification of the forces of nature, which, after long periods of inert repose, exhibit sudden and uncontrollable outbursts of violence: thus giants were represented as good-humoured and complacent when at rest, but implacable, savage, and treacherous when excited; while they were at all times impressed with a consciousness that, notwithstanding their huge bulk, and the excess of heads and arms with which many of them were gifted, they were but stupid monsters, unable to cope with the ready wit and keen intelligence of divine or even human beings, to whom they believed it was the decree of fate that they must ultimately succumb. In this respect, the giants typify the heathen element in its conflict with Christianity, and northern Sagas are rife with the histories of gigantic, wild, and cruel races, known as *Thursar* (Goth. *thaursjan*, to thirst, or *Jötnar;* Anglo-Saxon *etan*, to eat), who ate and drank voraciously, and subdued all things to their sway, until there came from the far East a people, who knew and worshipped the god of the universe under the name of the 'All-Father,' and who, by their greater skill, overcame the savage giants of the north, and compelled them to withdraw more and more into the recesses of the forests and mountains, whence they only emerged from time to time in the form of mountain trolls and giants.

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* Our authority for this statement is Geoffroy Saint-Hilaire, who quotes Watkinson's *Philosophical Survey of Ireland* (Lond. 1777). The bishop died in 1753.

The *dwarfs* who figure in the *Eddas* as cunning and crafty elves, skilled in magic and in the working of metals, are conjectured to have been a race of Oriental Lapps, who immigrated into Sweden and Norway later than the Finns, who were the descendants of the giants, and therefore the oldest of the races that now occupy the Scandinavian peninsula. When considered under the broadest signification of the term, dwarfs (Goth. *dvairgs*, which Grimm conjectures may be identical with the Greek *theourgos*, one who does supernatural works) typify the transition from inorganic to organic nature, and thus personify the subordinate powers of nature; and under this idea they are represented as assisting men by combining the primary ores into new mineral bodies, and fostering the development of fruits and seeds. Considered from this point of view, they occupy an intermediate position between giants and men; and while they fear both, they incline to serve the latter at the expense of the former, and thus appear under the form of beneficent elves (q. v.), fairies, and brownies (q. v.). During the latter part of the middle ages, when the traditionary folk-lore of Western Europe was being supplanted by the literature of the monks, which consisted mainly of legends of saints, the devil and the fallen angels took the place, in the minds of the illiterate, that had hitherto been occupied by giants and dwarfs; and the various supernatural feats of strength which had in earlier ages been ascribed to these imaginary beings, were attributed to Satan and his attendant spirits, or in some cases to the saints of the church.—See Grimm's *Deutsche Mythologie*, Thorpe's *Northern Mythology*, Grundtvig's *Nordens Mythologie*, and Petersen's *Nordisk Mythologie.*

GIANTS' CAUSEWAY (deriving its name from a mythical legend that it was the commencement of a road to be constructed by giants across the channel to Scotland), is a sort of pier or mole, of columnar basalt, projecting from the northern coast of Antrim, Ireland, into the North Channel, about 15 miles from Coleraine. It is part of an extensive and overlying mass of basalt, from 300 to 500 feet in thickness, which covers almost the whole county of Antrim and the eastern part of Londonderry, extending over an area of nearly 1200 square miles. The basalt occurs in several beds, interstratified with layers of ash. It covers secondary strata, converting the chalk into granular limestone, and the lias shale into Lydian stone, where it comes in contact with them. Several of the basaltic beds are more or less columnar, but three layers are remarkably so. The first appears at the bold promontory of Fair Head; its columns are coarse and large, exceeding 200 feet in height. The other two are seen together rising above the sea-level at Bengore Head. The lower one forms the Causeway at the place where it is uncovered, as it again gradually dips under the sea. It is exposed for 300 yards, and exhibits an unequal pavement, formed of the tops of polygonal columns, fitting so compactly that the blade of a knife can scarcely be inserted between them. The columns are chiefly hexagonal, though examples may be found with 5, 7, 8, or 9 sides; and there is a single instance of a triangular prism. The diameter of the pillar is very variable, but the average size is from 15 to 20 inches. Each pillar is divided by joints of unequal length, the concave hollow at the end of one division fitting exactly into the convex projection of the other. The rock is compact and homogeneous, and is somewhat sonorous when struck with a hammer.

The Causeway is divided into the Little, Middle, and Large Causeways. The Large Causeway, which is formed by the lowest of the three columnar beds of basalt, is about 30 feet wide, and runs more than 200 yards from its exposure on the cliff till it is covered by the sea. The Little and Middle Causeways are formed from the second columnar stratum, and are less remarkable than the other.

GIAOUR, a Turkish word, corrupted from the Arabic *kiafir* ('unbeliever'), and applied by the Turks to all who reject Mohammedanism, especially to European Christians. Though at first used exclusively as a term of reproach, its signification has been since modified, and now it is frequently employed merely as a distinctive epithet. Sultan Mahmûd II. forbade his subjects to apply the term G. to any European.—*G.* was the title of a poem written by Lord Byron, and published in 1813. Compare with G. the word Guebres (q. v.).

GIAVE'NO, a town of Piedmont, stands on the left bank of the torrent Sangone, 17 miles west-south-west of Turin. It is surrounded by walls, and possesses a castle, erected in 1369 by the abbot of the monastery St Michel della Chiusa. In 1003, Urban II., Count of Savoy, endowed this abbey with the lands of G., which, however, owing to the unproductiveness of the soil, were not of great value. The town was formerly a thriving commercial place, with a considerable trade in linen, leather, &c. It still possesses some manufactories of linen, cotton and silk stuffs, besides tanneries and iron forges. Pop. 9144.

GIBBET. See Hanging.

GIBBON, Edward, the historian of *The Decline and Fall of the Roman Empire*, was born at Putney, on the 27th April (O. S.) 1737, and was the first child of Edward Gibbon and of Judith Porten, both of good family, and the only one of seven children that survived infancy. Memoirs of his *Life and Writings* were written by himself, and these, with his letters and other miscellaneous works, were published after his death by his friend Lord Sheffield, with whom he had long carried on a most confidential correspondence. Few autobiographies are so interesting as that of G., and none more veracious. It is a self-portraiture, both in regard to what is said and in regard to the manner in which it is said—his pride, self-complacency, integrity, and contempt for the contemptible, and much beside, being all clearly revealed as proposed by him with 'truth, naked unblushing truth.' He reflects: 'My name may hereafter be placed among the thousand articles of a Biographia Britannica; and I must be conscious that no one is so well qualified as myself to describe the series of my thoughts and actions.' So, in his 52d year, after he had finished his 'arduous and successful work,' he proceeded to do it. Like most thinkers, his actions were few, and apart from his thoughts and the growth of his mind quite unimportant. He spent a sickly childhood in occasional lessons and desultory reading and discussion with his mother's sister, a lady of a strong understanding and warm heart, whom he calls 'the mother of his mind,' and to whose kindness he ascribes not only the bringing out of his intellectual faculties, but the preservation of his life in these critical early years. One of his temporary masters was the Rev. Philip Francis, the translator of Horace. His father, who seems to have been the somewhat impulsive possessor of the wreck of a fortune, had him entered at Magdalen College, Oxford, at the age of 15, when he was very imperfectly prepared for this crisis; his extensive reading and interrupted education having produced 'a stock of erudition that might have puzzled a doctor, and a degree of ignorance of which a school-boy would have been ashamed.' Here he spent 14 idle months, the chief result of which was, that in his incursions into controversial theology he became a convert to the Church of Rome, and found himself shut out from Oxford. He was by his father placed under the care of Mallet the poet, and a deist, but by his philosophy the young enthusiast was 'rather scandalised than reclaimed.' To effect his cure from popery, he was sent to Lausanne, in Switzerland, to board in the house of M. Pavillard, a Calvinist minister, a poor but sensible and intelligent man, who judiciously suggested books and arguments to his young charge, and had the satisfaction of seeing him reconverted to Protestantism, in witness of which conversion he received the sacrament in the church of Lausanne on Christmas-day 1754, his belief in popery having lasted not quite 18 months. He lived nearly five years in this house, respecting the minister, and enduring with more or less equanimity the 'uncleanly avarice' of his wife; and it was here that he began, and carried out steadily and joyously to an extent that will astonish very hard students, those private studies which, aided by his enormous memory, made him a master of erudition without a superior, and with hardly an equal. Here also he fell in love with Mademoiselle Susan Curchod, the daughter of a clergyman, a young lady beautiful and learned, who afterwards became the wife of M. Necker, the distinguished French minister and financier. G.'s father disapproved of this alliance, and he yielded to his fate. After his return to England and his father's house, he persevered in his studies as he best could.

He finished a little work in French, begun at Lausanne, and published it under the title of *Essais sur l'Etude de la Littérature* in 1761. In the same year he became captain in the Hampshire militia, in which he continued for two and a half years. Of this part of his career he observes: 'The discipline and evolutions of a modern battalion gave me a clearer notion of the phalanx and the legion; and the captain of the Hampshire grenadiers (the reader may smile) has not been useless to the historian of the Roman Empire.' The militia being disbanded, he revisited the continent, and travelled into Italy; and among the benefits of foreign travel, he notes its influence in suggesting the work of his life in these words: 'It was at Rome, on the 15th of October 1764, as I sat musing amidst the ruins of the Capitol, while the barefooted friars were singing vespers in the temple of Jupiter, that the idea of writing the decline and fall of the city first started into my mind.' His plan, originally circumscribed to the decay of the city, grew by years of reading and reflection and delay to embrace the empire. During these years his father died, leaving his affairs deranged, and he entered parliament for the borough of Liskeard at the beginning of the struggle with America, 'and supported with many a sincere and silent vote the rights, though not, perhaps, the interest, of the mother-country.' He sat eight years, but never had courage to speak; 'the great speakers filled him with despair, the bad ones with terror.' In 1776, the first volume of *The Decline and Fall* was published, and its success was prodigious. The reputation of the author was established before the religious world had had time to consider and attack the last chapters of the work—the 15th and 16th—in which, while admitting, or, at least, not denying, the 'convincing evidence of the doctrine itself, and the ruling providence of its great author,' he proceeds to account for the rapid growth of the early Christian church by 'secondary' or human causes. Hume, who was then slowly dying, in a highly complimentary letter, told him in regard to these chapters: 'I think you have observed a very prudent temperament; but it was impossible to treat the subject so as not to give grounds of suspicion against you, and you may expect that a clamour will arise.' The prophetic criticism was correct; the grounds of the 'clamour' being, at the best, only strong suspicions that, in becoming a convert from Popery to Protestantism, Gibbon had, like Bayle, gone on 'to protest against all sects and systems whatsoever.' That he did not like to see the barefooted friars in the temple of Jupiter is clear enough all through the six large and compact volumes of his history. He finished this great work on the 27th June 1787 at Lausanne, to which he had retired for quiet and economy after leaving parliament, and holding office under government for a short time. In his *Memoirs*, he tells the hour of his release from his protracted labours—between eleven o'clock and midnight—and records his first emotions of joy on the recovery of his freedom and the sober melancholy that succeeded it, all in a style and in a connection which, with much beside, must be studied in his own pages by those who would know Gibbon in his real greatness, self-complacency, egotism, and contemplative sadness. The lady of Lord Sheffield, his close friend, having died, G. left Lausanne for England to console him; and about six months after his arrival, he died without apprehension or suffering, on the 16th January 1794, in St James's Street, London, of an enormous rupture and hydrocele, which, as it gave him no pain, he had allowed to grow neglected without speaking of it to either friend or physician for thirty-two years.

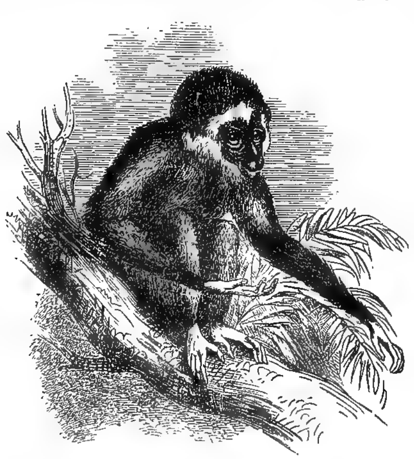
In person, G. became very corpulent, and the small bones of the big-headed delicate boy were in after years hardly adequate to sustain their load. Vanity was, perhaps, his only frailty. He affected the manners of the fine gentleman of last century to the end, and they adjusted themselves grotesquely to the unwieldy body and the massive mind.

It is not easy to characterise a man of so gigantic and cultivated an intellect in few or many phrases. He was a faithful friend, pleasant and hardly rivalled in conversation, not disliked by any one who came near him. His *Decline and Fall* is probably the greatest achievement of human thought and erudition in the department of history; at least Niebühr gives it this high praise. It is virtually a history of the civilised world for thirteen centuries, during which paganism was breaking down and Christianity was superseding it; and thus bridges over the chasm between the old world and the new. Its style is marked by the highest power of condensation, and is full of smiting phrases and ponderous antithesis. Byron designates him

> 'The lord of irony, that master-spell.'

He himself was not unaware of this part of his genius, and he says he cultivated it by reading the *Provincial Letters* of Pascal every year; which must have become eventually a mere form, for two careful readings sufficed to fix almost any composition indelibly on his impressible and retentive memory. His accuracy in regard to fact has never been successfully impeached, and his industry has never been questioned. The best edition of *The Decline and Fall* is that published by Dr W. Smith in 1854—1855, containing the notes, comments, and corrections of Guizot, Wenck, and Dean Milman.

GIBBON (*Hylobates*), a genus of apes, or tailless monkeys, natives of the East Indies. They are nearly allied to the orangs and chimpanzees, but are of more slender form, and their arms so long as almost to reach the ground when they are placed in an erect posture; there are also naked callosities on the buttocks. The canine teeth are long. The gibbons are inhabitants of forests, their long arms enabling them to swing themselves from bough to bough, which they do to wonderful distances, and with extreme agility. They cannot, however, move with ease or rapidity on the ground. The conformation of the hinder extremities adds to their difficulty in this, whilst it increases their adaptation to a life among the branches of trees, the soles of the feet being much turned inwards. None of the gibbons are of large size. The Common G., or Lar G. (*H. lar*)—black, with a border of gray hair around the face—is found in some parts of India, and in more eastern regions. The White-handed G. (*H. albimana*)—black, the face bordered with gray, and the four hands white—is a native of Sumatra. The Active G. (*H. agilis*), found in Sumatra, is particularly remarkable for the power which it displays of flinging itself from one tree to another, clearing at once, it is said, a distance of forty feet. The Wow-wow (*H. leuciscus*) is a G. found in Malacca and the Sunda Isles. The Hoolock (*H. Hoolock*) is a native of the Garrow Hills. The Siamang (*H. syndactyla*), a Sumatran species, differs from the rest of the genus in having the first and second fingers of the hinder extremities united to the second joint. All the gibbons are of gentle disposition, and easily domesticated.



White-handed Gibbon (*Hylobates albimana*).

GIBBONS, Orlando, an eminent English musician, was born at Cambridge in 1583. At the age of 21, he became organist of the Chapel Royal; and in 1622, on the recommendation of the learned Camden, he received from Oxford University the degree of doctor in music. He was the best church composer, and, according to Anthony Wood, 'one of the rarest musicians of his time.' His madrigals have always been popular. Of these, three, *Dainty Sweet Bird*, *O that the Learned Poets*, and *The Silver Swan*, are considered far superior to most compositions of the kind. He composed the music for the marriage-ceremonial of Charles I., in 1625; but while attending it officially, he caught the small-pox, and died at Whitsunday thereafter. A monument to his memory, erected by his wife over his burial-place in Canterbury Cathedral, is still shewn. His anthems, *Hosannah to the Son of David! Almighty and Everlasting God!* and *O Clap your Hands together!* are reckoned by Wood 'master-pieces of the most ingenious and scientific writing in fugue that musical skill ever brought forth.' His two brothers, Edward, organist of Bristol, and Ellis, organist of Salisbury, were likewise good musicians. Edward, sworn in a gentleman of the Chapel Royal in 1604, was master to the famous composer Matthew Lock. During the civil wars he lent Charles I. £1000, for which he was afterwards deprived of a considerable estate, and, with his three grandchildren, thrust out of his house at a very advanced age. In the *Triumphs of Oriana* are two madrigals by Ellis Gibbons. G.'s son, Dr Christopher Gibbons, at the Restoration, was appointed principal organist to the king and to Westminster Abbey, and by a recommendatory letter from Charles II. was created doctor in music by the university of Oxford. Celebrated for his organ playing, he is said to have been the instructor on that instrument of Dr John Blow, the well-known composer of the pieces published under the title of *Amphion Anglicus*, who died in 1708.

GIBBONS, Grinling, an eminent English sculptor and wood carver, of Dutch extraction, was born in London in 1648. On the recommendation of Evelyn, he was, by Charles II., appointed to a place in the Board of Works, and employed in the ornamental carving of the choir of the chapel at Windsor. His works display great taste and delicacy of finish, and his flowers and foliage have almost the lightness of nature. For the choir of St Paul's, London, he executed the foliage and festoons, and those in lime-tree which decorate the side-aisles. At Chatsworth, the seat of the Duke of Devonshire; at Burleigh; at Southwick, Hampshire; and other mansions of the English nobility, he executed an immense quantity of carved embellishment. At Petworth, he devised the ceiling for a room, which is believed to be his *chef-d'œuvre*. In marble and bronze, he also produced several fine pieces. Among these are the statue of James II., behind the Banqueting Hall, Whitehall; of Charles I., at Charing Cross; and that of Charles II., at the Bank of England. The wooden throne at Canterbury; the monument of Viscount Camden at Exton, Rutlandshire; and the baptismal font at St James's Church, London, are by him. He died August 3, 1721.

GIBBO'SITY (Lat. *gibbus*, Gr. *hūbos*, *kuphos*, humpbacked), a state of disease characterised by protuberance of a part of the body; chiefly applied to humpback or other distortions depending on disease (Rickets, q. v.) of the spinal column.

GI'BBOUS, a term signifying 'protuberant,' 'swelling out,' applied to bodies which are double-convex, and particularly to the moon, when she is within a week of the full.

GI'BEAH, a Hebrew word signifying a 'hill,' and giving name to several towns and places in Ancient Palestine. The only one requiring special mention is *Gibeah-of-Benjamin*, a small city about four miles north of Jerusalem. It was the scene of the horrible story of the Levite and his concubine, related in the 19th chapter of Judges, and subsequently the residence, if not the birthplace of King Saul. Gibeah-of-Benjamin has been identified with the modern village of *Tuleil el-Fûl*.

GIBEL (*Cyprinus gibelio*), a fish of the same genus with the carp, but of the division of the genus destitute of barbules at the mouth, by which it is easily distinguished from the carp, whilst from the crucian it is at once distinguished by its forked tail. The weight is seldom much more than half a pound, although specimens have been caught of two pounds weight. The G. is common in some parts of continental Europe; it is supposed to have been introduced into England from Germany, but is now fully naturalised in ponds near London and in many other parts of the country. It is generally known in England as the Prussian carp. It is a good fish for the table, but affords little sport to the angler, seldom taking any bait readily. It feeds partly on aquatic plants, partly on worms and molluscs. It is very tenacious of life out of the water, and has been known to recover after thirty hours.

GIBELLI'NA, a village of Sicily, in the province of Trapani, and 34 miles south-east of the town of that name, is situated amid mountains, has a castle, and a pop. of about 5000.

GI'BEON (Heb. signifies 'belonging to a hill'), a celebrated city of ancient Palestine, about 5 miles north-west of Jerusalem. At the conquest of Canaan by the Israelites under Joshua, it was inhabited by the Hivites. By a clever stratagem, the Gibeonites insured the alliance and protection of the invaders, and so escaped the fate of Jericho and Ai; but their deceit being afterwards found out, they were reduced to a condition of servitude, being appointed 'hewers of wood and drawers of water unto all the congregation.' When the five kings of the Amorites besieged G., on the ground of its having entered into a traitorous compact with the common enemy of all the Canaanites, Joshua hastened to its help, and overthrew the besiegers with great slaughter. The battle was attended, we are informed, with supernatural phenomena—viz., the standing still of the sun upon Gibeon, and of the moon in the valley of Ajalon; but as the passage where this occurs (Joshua x. 13) is immediately followed by these words: 'Is not this written in the book of Jasher?' it has been thought that it may perhaps be only an extract from that collection of national songs; and the fact of its forming two hemistichs, while the rest of the narrative is in prose, certainly does not weaken the probability of this theory. If such a supposition be adopted, the necessity for accepting the statement literally is done away with, and the supposed miracle is resolved into a hyperbole of oriental poetry. The city of G. is mentioned various times in the history of David and his captains; but its sanctity, in the eyes of the Jews, arose from the circumstance of it—or the hill near it—having been for a time the seat of the tabernacle of the congregation, and the brazen altar of burnt-offering. It was at the horns of this altar that the ruthless Joab was slain by Benaiah, the son of Jehoiada; and here Solomon, in the beginning of his reign, with magnificent ceremony sacrificed a thousand burnt-offerings.

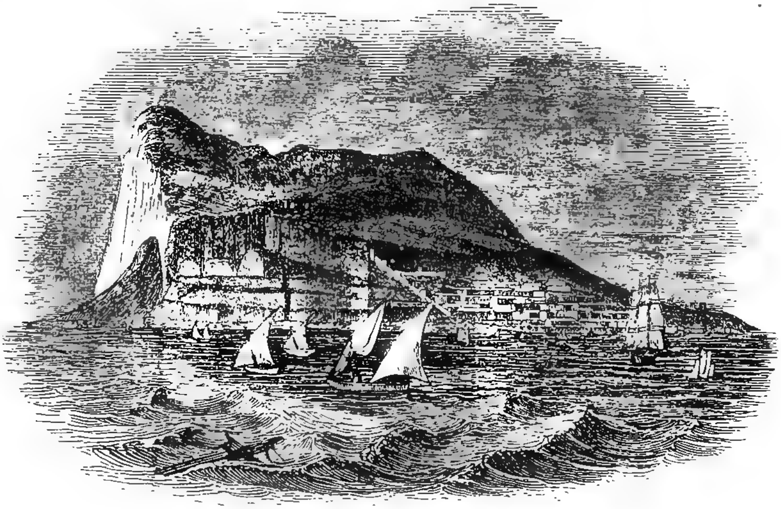
GIBRA'LTAR, a rocky promontory, 3 miles in length and ¾ mile in average breadth, forms the southern extremity of Spain. It is situated at the extremity of a low peninsula, which connects it on the north with Andalusia; its most southern headland, Point Europa, is in lat. 36° 2′ 30″ N., and long. 5° 15′ 12″ W. Five and a half miles distant across the sea is the Spanish town of Algesiras, between which and G. lies the Bay of Gibraltar, called also the Bay of Algesiras. On the east side of this bay is the town of G., inhabited by a motley population of from 15,000 to 20,000 English, Spaniards, Jews, and Moors.

The strip of peninsula connecting G. with the Spanish territory is called the 'neutral ground.' It is so low, that, seen from the sea but a few miles off, G. has the appearance of a detached rock. The approaches both from this neutral ground and from the sea are guarded by a great number of very powerful batteries, and by fortifications so strong in themselves and in their relative bearing on each other, that the rock may fairly be regarded as impregnable so long as a sufficient garrison remains for its defence, and sufficient provision for the maintenance of the troops and any civil inhabitants suffered to reside there during hostilities. The rock is composed of gray primary marble, deposited in strata from 20 to 40 feet thick. The surface near the sea is sandy and red in appearance; higher up, the rock is covered only with short and scanty grass or moss. Seen from the sea, its aspect is uninviting, the whole appearing denuded of trees and verdure: nevertheless, there are grassy, wooded glens in the nooks of the mountain. In the crevices of the rock grow asparagus, capers, palmitas, aloes, and cacti, while the fauna disporting on the wild, rarely trodden upper portions, comprises rabbits, partridges, pigeons, woodcocks, and fawn-coloured Barbary apes. For various military reasons, shooting is discouraged, and these animals therefore enjoy the utmost impunity. The rock, at its highest point, the Sugar Loaf, attains an elevation of 1439 feet above the sea. It is perforated by numerous caverns, the largest of which, called the 'Halls of St Michael,' have an entrance about 1000 feet above the sea. Thence there is a descent through a succession of caves—some ample chambers, others mere passages, through which it is barely possible to creep—to a depth of 500 feet below the entrance: at this point foul air has barred further ingress; but the roaring of the sea has been distinctly heard, which leads to the inference that these gloomy hollows have communication with the waves beneath. Large stalactites are found in most of the caverns, and interesting fossils abound throughout the peninsula.

The climate of G. is, as a rule, healthy, although the period from July to November, when the greatest heat prevails, is attended with some risk to Englishmen: there is, however, a remarkable exception in the case of infants at the period of teeth-cutting, to whom the atmosphere of the place is peculiarly fatal. Of late years, the energetic measures adopted by the engineer-officers to improve the drainage of the town have, coupled with stringent police regulations, greatly diminished the death-rate; and G. is as remarkable now for its cleanly appearance as, up to 1814, it was celebrated for being one of the dirtiest towns in Europe. The place is, however, subject to a periodical visitation, once in twelve years, or thereabout, called the G. fever, an epidemic which works sad havoc among the troops.

There are no springs of fresh water on the rock, and the inhabitants are therefore compelled to depend on the rain-fall. In consequence of this, every precaution is adopted to preserve as much of the water as possible; tanks are fed systematically by the drops collected from private roofs, and conduits are made to guide the drainage from the rock surface into great public reservoirs. Among the latter, the Navy Tank, for the supply of ships coming to the port, is conspicuous, its capacity being from 9000 to 11,000 tons of water. Large stores of grain are maintained in case of siege; but the peninsula does not produce sufficient food to furnish current sustenance for its population. Provisions in plenty can, however, be procured at a cheap rate from the opposite African shore.

The Bay of Algesiras or Gibraltar, is about 8 miles long by 5 broad, with a depth in the centre of upwards of 100 fathoms. The anchorage, however, is not very good, and the bay is quite exposed, especially to the south-west winds, which sometimes drag the ships from their anchors and drive them ashore.



Rock of Gibraltar.

G. has been known in history from a very early period. The Phœnician navigators called it *Alube*, which the Greeks corrupted into *Calpe*, its classical name. With Abyla (now Ceuta) opposite, it formed the Pillars of Hercules, long held to be the western boundary of the world. It is impossible to doubt that such leaders as Hannibal and his fellow-Carthaginians must have been awake to the importance of this rock in their expeditions from Africa into Spain; but we have no certain information of its natural strength being made available for defensive or aggressive purposes until the year 711 A.D., when the Saracens, passing into Spain under Tarif ebn Zarca, a general of the Calif Al Walid, for the conquest of the Visigothic kingdom, fortified it, as a base of operations, and a ready point of access from the Barbary coast. From this chieftain it took the name of Gebel-Tarif, or Hill of Tarif, of which Gibraltar is a corruption. One of the old towers of this early castle still remains. Subsequently, G. shared in the revolutions among the Moors of Spain, being now in the hands of Almoravide princes from Africa, and again in the power of native Arab monarchs. In 1309, after a gallant defence, it succumbed to the Christians of Castile under Don Antonio de Guzman. The king of Castile immediately constructed additional works and a dock-yard at the 'Old Mole,' and also took measures to induce a Christian population to settle in the town. The Moors besieged G. in 1315 ineffectually, but in 1333 it fell to the army of the king of Fez, whom a siege by the Castilian monarch failed to dislodge. In 1436, the Spaniards tried once more to take the stronghold; but they were unsuccessful, until, in a subsequent siege in 1462, the place was captured through the treachery of a renegade Moor. From this time the Moorish power was too thoroughly broken for any serious attempt to be made for the recovery of G., which remained in the hands of the Spanish, and was so strengthened by additional fortifications, that the engineers of the 17th c. accounted it impregnable. A combined Dutch and English force, however, under Sir George Rooke and the Prince of Hesse Darmstadt, demonstrated that G. could be taken; for in 1704, after a vigorous bombardment, and a landing in force, the governor deemed it wise to capitulate. How great, even then, were the capabilities of the rock for defence is seen from the fact that the garrison, only 150 strong, placed 276 of the English *hors-de-combat* before they surrendered.

Since 1704, G. has remained continuously in the possession of the British, but not without the necessity of their resisting many desperate efforts on the part of Spain and France to dislodge them. Before the victors had been able to add to the defences, their mettle was severely tried by a siege in 1704—1705. In 1720, it was threatened, and in 1727 actually attacked by an overwhelming force under the Count de las Torres. During this siege, the place was near falling into the hands of the assailants. The most memorable, however, of the sieges to which G. has been exposed, commenced in 1779, when Britain, being engaged in the struggle with its revolted colonies, and at the same time at war with France, Spain took the opportunity of joining the coalition, and directed her whole strength against the isolated garrison of this small but redoubtable fortress.

The communications with Spain were closed on the 21st June 1779, and a strict blockade established by the Spanish fleet; the strength of the besieged force being at this period 5382 men, including 1095 Hanoverians, under General Eliott, the governor. Famine speedily set in; the enemy pushed forward his works for the future bombardment, and commenced active annoyance on the 12th January 1780, by firing several shots into the town. Five days later, Admiral Rodney overcame the Spanish admiral, threw a good supply of provisions into the fortress, added 1000 men to the garrison, and, removing all useless mouths, left it dependent on its own strength. During 1780 little of importance happened; scurvy disabled many of the defenders; the besiegers advanced their works, continually increased their force, and by obtaining possession of the opposite African ports, cut off the last chance of provisions being obtained for the stronghold.

In April 1781, starvation stared the British in the face, when, on the 12th, Admiral Darby convoyed 100 merchant-vessels into the bay. The Spaniards instantly opened their fire, hoping to reduce the debilitated garrison before effectual aid was received. 114 pieces of artillery, including 50 13-inch mortars, poured their deadly missiles into the place: for many days this bombardment lasted with unabated vigour, and, though less incessant, it continued without intermission until the 26th November, when, in a desperate midnight sally, the British succeeded in destroying the more advanced of the enemy's lines, in setting fire to many of his batteries, and in blowing up his principal depôt of ammunition. This daring enterprise, successfully carried out against lines mounting 135 guns, was attended with surprisingly small loss, and forms one of the most brilliant incidents in a magnificent defence.

After this repulse, the Spaniards ceased severe hostilities for several days, up to which cessation the garrison had been incessantly bombarded for nearly eight months, and had had 568 officers and men placed *hors-de-combat.* The siege continued, however, throughout the winter and spring of 1782 without any remarkable incident. In July, the Duc de Crillon took command of the assailants, and preparations were made for the grand assault. Additional batteries were constructed on the land-side, and floating batteries built for this special siege to batter the fortress from the sea. The latter consisted of ten large vessels, whose sides were fortified by seven feet of timber and other materials supposed to be obstructive of shot; they were covered by slanting shot-proof roofs, and were intended to be moored by massive chains within half-range of the rock. Covered boats, destined to disembark 40,000 troops, were at the same time prepared. The effective force with which General Eliott had to withstand these efforts comprised, with the marine brigade, about 7000 men.

The great attack commenced on the 8th September by a bombardment simultaneously on all sides; 9 line-of-battle ships poured in their broadsides; 15 gun and mortar boats approached the town; while, from the Spanish lines, 170 pieces of ordnance of large calibre opened in one magnificent discharge. This terrific fire continued till the 12th; when the combined French and Spanish fleets, numbering 47 sail of the line, the 10 battering ships mentioned above, esteemed indestructible, with many frigates and smaller vessels, anchored in the Bay of Algesiras. On the 13th every gun of besiegers and besieged was in play. The battering vessels proved, as anticipated, invulnerable to shot and shell. At noon the enemy depressed their guns and did much damage; and the defenders then resorted to the expedient of red-hot balls. These, with carcasses, and incendiary shells, were concentrated on the battering ships in unceasing volleys. Success was doubtful for some hours, but towards evening the gigantic efforts of the British force began to produce fruit. The ship of the Spanish admiral was in flames, the second in command was soon no better off, and although by eight o'clock the attacking squadron was completely silenced, the fire of red-hot shot was continued without intermission till morning. By 4 A.M. on the 14th, eight of the battering ships were on fire. In short, of the ten invincible batteries, every one was finally burned; the Spaniards lost at least 2000 in killed alone; and the naval attack was completely repulsed with a loss to the heroic garrison of only 16 killed and 68 wounded. It is worthy of record, that notwithstanding the fury to which the British soldiers were wrought, Brigadier Curtis, with a devoted band, made gallant and successful efforts to preserve the poor fellows who were left by their affrighted comrades to perish in the burning hulks.

The great bombardment of the 13th September 1782, was the crowning triumph of the siege; but the firing continued in a harassing degree from the Spanish lines, until the 2d February 1783, when the Duc de Crillon, as much to his own as to General Eliott's satisfaction, announced the conclusion of peace. The Spaniards welcomed their late enemies with the enthusiasm due to heroes. The thanks of parliament were cordially awarded to the gallant band; while brave General Eliott received the decoration of the Bath, and subsequently the title of Lord Heathfield. More space has been allowed to the description of this memorable struggle than we can ordinarily spare to specific wars; but the glorious place it occupies in British annals, the length to which it extended (3 years, 7 months, and 12 days), the disparity of force, the brilliant defence, and the comparatively small loss of the garrison—333 killed, 536 died of disease, 1008 wounded, and 43 deserted—seem to point to this the last siege of G. as an exploit not to be passed over by a mere reference.

Since 1783, the British possession of G. has been unmolested, and few events have happened of any interest, apart from the general history of the empire. At present, England guards this formidable rock with jealous care; every available point for defence bristles with artillery; the mountain is honeycombed with galleries and bomb-proofs, steep escarps bar all approach, and batteries hewn in the solid stone, frown alike on friend and foe. Immense stores of provision, water, and munitions of war are constantly maintained; and the whole is garrisoned by a thoroughly efficient force of about 5000 infantry, with 1000 artillery, and a smaller body of engineers. The jealousy for its safety would appear to rest rather on making its preservation to the crown of England a point of honour than a matter of national importance; for beyond being a standing menace to Spain, and a source of constant irritation, it is difficult to see its actual use to Great Britain. The harbour is not of great value, and the fortress by no means commands the strait.

With regard to the internal organisation of G., the law of England prevails; the governor's decision being final in civil cases not involving more than £300. In more important causes, an appeal lies to the British Privy Council. There is a good police force, under a police magistrate, and tolerable order usually prevails. All religions enjoy a perfect toleration; the Catholics are most numerous, having a bishop and a cathedral; next the Jews, who possess four synagogues; the Protestants, though less numerous, have also a bishop. There are three good public libraries; the best and oldest being that started by the famous Colonel Drinkwater, the historian of the great siege.

G. is a free port, and a resort in consequence of Spanish smugglers, who drive an amazing trade by introducing contraband goods into Spain. The British government is not altogether free from a charge of breach of faith, in the toleration it has given to these dishonest men; for it is bound by many engagements to use its best exertions to prevent any fraud on the Spanish revenues, in consequence of its possession of this peninsula. The colony of G. was for many years a most costly one; but of late, by judicious management, it has been made to defray the expenses of its civil government; the heavy charge for the military force being, of course, payable out of imperial funds. The revenue amounts to about £30,000, and is derived from customs, port and quarantine dues, land revenues, stamps, and licences. Its cost to this country over and above the revenue collected, is computed for the year 1862—1863 to be £300,000.

The town of G. consists of three parallel streets, in which the curious intermingling of English architecture with the Spanish houses spoils the effect of the whole. English domestic building is eminently unsuited to a climate light and hot, like Gibraltar. There are, nevertheless, some handsome structures.

GIBRALTAR, STRAITS OF (anciently the *Straits of Hercules*), extend from Cape Spartel to Cape Ceuta on the African coast, and from Cape Trafalgar to Europa Point on the coast of Spain. The Straits narrow toward the east, their width between Europa Point and Cape Ceuta being only 15 miles, while at the western extremity it is 24 miles. The length (from east to west) is about 36 miles. The tide at Tarifa rises from 7 to 8 feet. Through these Straits a continual current runs from the Atlantic, and is so strong that sailing vessels bound westward can pass only by the aid of a brisk wind from the Levant. It is supposed that the waters of the Mediterranean find an outlet here by an under-current, as well as by the currents which flow westward along the European and African shores respectively.

GIBSON, JOHN, one of the first sculptors of the day, was born at Conway, in North Wales, in 1791. His father, a landscape-gardener, removed to Liverpool about the beginning of this century, and here G. received his education. His love of art manifested itself strongly, even while he was a mere boy at school, and at the age of 16 he entered the marble works of the Messrs Francis, by whom he was introduced to Roscoe, whose art-treasures were placed at his service. Through the kindness of some wealthy friends he was enabled, in his 26th year, to proceed to Rome, where he became a pupil of Canova, and after his death of Thorwaldsen. G. has fixed his residence in that city, and has very seldom revisited his native country. His first reappearance in England was after a lapse of 28 years. At first, G. shewed himself, naturally enough, a faithful follower of Canova, whose graceful softness he made his own. But he did not stop there. By the study of the antique, which Thorwaldsen was the very man to stimulate, G. finally rose to ideal purity, and a thorough realisation of the grace of form. This advance is clearly traceable in his works. His first important work was a 'Nymph unfastening her Sandal.' This was followed by a group representing 'Psyche borne by the Zephyrs,' which he executed for Sir George Beaumont, and which he has several times repeated. In the church of St Nicholas, in Liverpool, there is a bas-relief of G.'s representing a traveller conducted on the dangerous path of life by his guardian angel. Among his greatest works are his 'Aurora rising from the Waves to announce the Day' (belonging to Lord Townshend); 'The Wounded Amazon' (the property of the Marquis of Westminster); 'The Hunter and his Dog;' 'Narcissus,' 'Helen,' 'Sappho,' 'Proserpine,' and 'Venus.' A spirit of the finest poetry breathes through these works:—they are thoroughly classical, and are marked by a refined and noble severity. His grand innovation, however, viz., that of tinting his figures —though he defends the practice by a reference to Grecian precedents—has excited much keen controversy, and cannot yet be said to have commended itself to the public taste. Among his portrait-statues, those of Huskisson and Peel, George Stephenson, and Queen Victoria, are the best. G. was elected a member of the Royal Academy in 1836.

GIBSON, THOMAS MILNER, the RIGHT HON., politician and statesman, only son of Major Milner-Gibson, was born at Trinidad, 1807, and educated at Trinity College, Cambridge, where he took a wrangler's degree in 1830. He entered parliament as M.P. for Ipswich in 1837, on the Conservative interest. As his political views expanded, he threw off his allegiance to Sir Robert Peel, for which he paid the penalty of the loss of his seat in 1839. In this year he assumed the name of Milner, by royal licence. His eloquence, ability, and superiority to party-ties having gained for him the confidence of the Liberals, in 1841 he successfully contested Manchester against the Conservative candidate, Sir G. Murray. He had previously distinguished himself by his advocacy of free-trade; and during the succeeding five years, occupied a prominent position, both in and out of parliament, among the orators of the League. When the measure for the repeal of the Corn Laws was carried, and the Whigs came into office in July 1846, he was made a privy councillor, and vice-president of the Board of Trade; but, in April 1848, gave up a post which was by no means commensurate with his powers and pretensions. More and more identifying himself with the opinions held by Messrs Cobden and Bright, when the war with Russia broke out, he espoused the unpopular doctrines held by what was called the 'Manchester school,' or as it was otherwise designated, the 'Peace party.' In 1857, the Whigs and Conservatives of Manchester successfully united to unseat him and his colleague, Mr Bright. Milner-G. was, however, returned at the end of 1857 for the borough of Ashton-under-Lyne, which he has continued to represent. In 1858, he moved an amendment to the second reading of the Conspiracy Bill, expressing the abhorrence of the House at the attempt by Orsini upon the life of Napoleon III., and its readiness to amend defects in the criminal law; but censuring the government for not replying to Count Persigny's despatch of January 20, 1858. The amendment was carried, and the government of Lord Palmerston was shattered to pieces. When that noble lord again took office next year, he recognised the skilful parliamentary-tactics and influence of Milner-G., by offering him a place in his cabinet. He became *ad-interim* president of the

Poor-law Commission in June 1859, and President of the Board of Trade next month. The duties of this office he still (1862) efficiently discharges. Milner-G. will be honourably and gratefully remembered for his strenuous advocacy of the abolition of the taxes on knowledge. He was for twelve years president of the association for the repeal of these taxes. His labours were crowned with success, first by the repeal of the advertisement duty in 1853, and secondly, by the repeal of the compulsory stamp on newspapers in 1855. There then only remained the paper duty. Milner-G. had made several attempts in previous sessions to induce successive chancellors of the Exchequer to abolish this impost; and in 1858, he carried a resolution, 'that the maintenance of the excise on paper, as a permanent source of revenue, would be impolitic.' Mr Disraeli, then Chancellor of the Exchequer, consented to accept this motion, but held himself at liberty, with his party, to oppose the Paper Duty Abolition Bill proposed by the government, of which Milner-G. was a member, in 1860. The bill was thrown out by the House of Lords on financial grounds, but was, next session, incorporated into the general financial scheme of the year: and on the 1st of October 1861, the paper duty ceased to exist. Milner-G. has since received a valuable and gratifying commemorative presentation of plate from the members and friends of the Association for the Repeal of the Taxes on Knowledge. This testimonial was presented to the right honourable gentleman at a public banquet in London, in the early part of the present year (1862).

GI'DDINESS. See VERTIGO.

GI'DEON (Heb. signifies 'a hewer' or 'cutter down,' i. e., 'a brave soldier') was the name of the greatest of all the judges of Israel. He was the youngest son of Joash the Abiezrite, and lived with his father at Ophrah, in Manasseh. The period in which his youth was cast was a gloomy one for Israel. The people had fallen into idolatry, and as a punishment 'the Lord had delivered them into the hand of Midian.' It does not appear that the Midianites exercised their supremacy by any actual form of government. Being chiefly wandering herdsmen, like the Bedouin Arabs of the present day, they were rather in the habit of regularly coming up from the desert 'to destroy the increase of the earth.' So terrible were their marauding expeditions, that it is said they 'left no sustenance for Israel, neither sheep, nor ox, nor ass.' Only in the mountain strongholds, and in dens and caves among the hills, could the people preserve their liberty and the produce of their fields. At last, however, the Israelites began 'to cry unto the Lord,' and a prophet is sent to stir up their religious and patriotic feelings. They were now obviously ripe for resistance to the enemy, at least portions of them. It is at this point that G. is introduced by the writer of the Book of Judges, 'threshing wheat by the winepress to hide it from the Midianites.' The steps which he took to secure the freedom of his countrymen are too well known to require description. It is sufficient to say that, with a small but resolute force of Jewish patriots, he fell suddenly upon the enemy in the neighbourhood of Mount Gilboa, and utterly routed them. The pursuit of the fugitives was continued far across the Jordan towards the Syrian Desert. The effect of the victory was most decisive. The Midianites, we are told, 'lifted up their head no more,' and the land of Israel enjoyed 'quietness forty years in the days of Gideon.' The people wished to make him king, but he religiously refused to tamper with the theocracy. He left behind him 70 sons.

GIEN, a small manufacturing town of France, in the department of Loiret, is situated on the slope of a hill on the right bank of the Loire, 38 miles east-south-east of Orleans. It is well built, is connected with the opposite bank of the river by a handsome stone-bridge of 12 arches, has an old church (the church of St Etienne), which has been much hurt by repairs, and, surmounting the hill, it has an interesting old castle, in a good state of preservation. G. has important manufactures of faience and leather, and some trade in wine, corn, salt, saffron, and wool. Pop. 5697.

GIESELER, JOHANN KARL LUDWIG, German church historian, was born 3d March 1792, at Petershagen, near Minden, where his father was a clergyman. After attending the orphan-house school and university of Halle, and after teaching for a year in that town, in October 1813, he entered the army as a volunteer during the war of liberation. On the re-establishment of peace, however, in 1815, he returned to his former situation, where he taught for two years, and then became *conrector* of the Gymnasium at Minden. In the following year, he was appointed to the directorship of a newly instituted gymnasium at Cleves, and published an essay on the origin and early fate of the gospels (*Historisch-Kritischer Versuch über d. Entstehung u. d. frühern Schicksale d. schriftlichen Evangelien* (Leipz. 1818). This and other works were the occasion of his being called, in 1819, as ordinary professor of theology, to the university of Bonn, which had been established but shortly before. It was in this place that he began his great work on church history, of which 3 vols. appeared during his life, and two more after his death, under the editorship of E. R. Redepenning. This work, which brings down the history of the church to the most recent times, has been translated into English, and is so greatly valued for its method of picturing the times in happy quotations from contemporary writings, that the first three volumes have already gone through several editions. In 1831, G. was called to a chair in Göttingen; became, in 1837, a consistorial councillor; and later, also knight of the order of the Guelphs. He was deeply devoted to his professorial duties, but took at the same time a practical interest in many benevolent schemes, especially in the Göttingen orphan-house. Besides numerous contributions to periodicals and publications on contemporary questions, he, edited, among other things, the *Narratio de Bogomilis* of Euthymius Zygabenus (Gött. 1842), as well as Petrus Siculus' *Historia Manicheorum seu Paulicianorum* (Gött. 1846), and left behind him a volume on the history of dogmas, which was given to the world by Redepenning in 1856. He died 8th July 1854. A notice of his life will be found prefixed by the editor to the 5th vol. of his *Church History*.

GIE'SSEN, the principal town of the province of Upper Hesse, in the Grand-duchy of Hesse, or Hesse-Darmstadt, is pleasantly situated in a beautiful and fertile plain at the confluence of the Wieseck and the Lahn, 34 miles north of Frankfurt-on-the-Maine. Pop. about 9000. It is chiefly deserving of notice for its well-endowed university (founded in 1607), which possesses commodious buildings for lecturing, and has well-appointed anatomical and other museums, a good library, observatory, a famous chemical laboratory (where the illustrious Liebig experimented), botanical garden, &c. There are also various endowed schools, as the Gymnasium, Real-Schule, &c., and several institutions for the preliminary instruction of different branches of medical knowledge, which are connected with the university. G. has manufactories for the preparation of tobacco, liqueurs, vinegar, soap, and leather, and is an active thriving town.

GIFFORD, William, an English poet, translator, and critic, was born at Ashburton, in Devonshire, in April 1756. At the age of 15 he was apprenticed to a shoemaker, but exhibiting a very decided bias towards learning and poetry, he was enabled, through the kindness of some friends, to acquire an education, and to proceed to Exeter College, Oxford. G.'s first publication appeared in 1794, being a satirical poem, entitled the *Baviad*, directed against the *Della Cruscans* (q. v.). It crushed them in a moment, like the fall of a rock. Flushed with success, G. next year produced the *Mæviad*, which satirised the offences in the high places of the drama. In his third satire, G. assailed *Peter Pindar* (Dr Wolcot); and the coarse and witty doctor, the breath of whose nostrils was literary warfare, rushed to the fray with *A Cut at a Cobbler*, and bespattered his opponent with mud from the kennels. Canning and his friends having at this time set up the *Anti-Jacobin*, G. was appointed editor, and through the influence he acquired among the leaders of at least one section of the political world, he was appointed to offices, the joint emoluments of which amounted to £900 per annum. In 1802, he translated *Juvenal*, and appended to his work a sketch of the poet's life. He edited the works of Massinger, Ford, Shirley, and Ben Jonson, and in his notes assailed former editors with the utmost ferocity. In 1808, he was appointed editor of the *Quarterly Review*, started by Sir Walter Scott and his friends in opposition to the *Edinburgh*. The periodical under his charge attained great influence, and he continued his editorial duties till within two years of his death. He died in London on the 31st December 1826.

G. possessed much satirical acerbity and poison, but as a poet he holds no rank whatever. As annotator and editor of the old English dramatists, he did good service, but his labours in this field are disfigured by suspicion and malignity. As a critic, he was bitterly partial and one-sided, and his praise and blame depended on the political leanings of the writer. Leigh Hunt was to be pursued like a wild-beast, because he was a Liberal; and the flower-garden of *Endymion*, every rose of which was fed by the dews of paradise, was to be trampled upon with critical hoof, because Keats was known to have written a sonnet in praise of Hunt, and was understood to be his private friend. G. had been rudely nurtured; he lived in a time of great political uncharity; and if a portion of the bitterness he displayed may be set down to natural disposition and turn of mind, the larger part, perhaps, must be explained by the pressure of the times in which he lived.

GIFT, in English Law, means a gratuitous transfer of property. Any person is at liberty to do what he pleases with his own property, and to give it away with or without consideration, if he is so inclined. When he gives away goods or chattels, mere delivery of possession, accompanied by words of gift, is sufficient to transfer the property; and then the transaction is irrevocable. But if he does not give possession of the goods at the same time, then, in order to be binding upon him, he must execute a deed or writing under seal. The reason of this is, that a mere verbal promise, without some legal consideration, is nugatory and revocable; whereas, when he executes a deed, he is stopped from ever afterwards denying it. Where the property given is not personal, but real, then a deed is in general absolutely necessary to transfer the property. A will is the most familiar example of a gift of property both real and personal, for the testator generally, in such a case, gives away his property gratuitously. Each gift of personalty by will is better known under the name of a legacy; and a gift of land is generally called a devise.

As sometimes the power of giving away property gratuitously is abused, in order to defraud and defeat creditors, it is provided by statute, that a voluntary conveyance, whether of chattels or land, made by a person who is at the time insolvent, shall be void as against such creditors; and they are entitled, accordingly, to recover the property from the donee (13 Eliz. c. 5). The gift, however, even in such a case, stands good against the donor himself. So, if any person give by deed gratuitously any land, and then sell the same land, the gift will be void against the *bonâ-fide* purchaser (27 Eliz. c. 4).

There is a peculiar kind of gift, or rather a gift made in peculiar circumstances, called a *Donatio Mortis Causa*, i. e., a gift made by a person on death-bed of some personal property, such as chattels, money, bills of exchange, &c. Such gifts are held good, if they comply with certain conditions. This is in substance a mode of giving personal chattels to a particular individual, without the necessity or intervention of a will; but such gifts are so often afterwards disputed, that it is better to include them in a will.

In Scotland, a gift may be made of goods in the same manner as in England; but it is usually called a *Donation* (q. v.). Gratuitous alienations by persons in insolvent circumstances are also held to be void as against creditors (stat. 1621, c. 18). Though it is competent in Scotland to make a gift of goods or money by merely delivering the possession thereof, accompanied by words of gift to the donee, still there is this peculiarity, that if the transaction is afterwards impeached, it can only be proved in Scotland by the donor's writ or oath, no matter how many witnesses may have been present; whereas, in England, it can be proved by ordinary witnesses, like any other fact.

Gift, in the Law of Scotland, is also often used to denote a grant or appointment by the crown or a court, such as gifts of non-entry, escheat, bastardy, tutory, &c.

GIGG, GIGA, or **GIGUE**, the name of a short piece of music, much in vogue in olden times; of a joyful and lively character, and in $\frac{6}{8}$ or $\frac{12}{8}$ time, sometimes in $\frac{3}{8}$; used formerly as a dance-tune, and often introduced as a movement of a larger composition. It consists of two parts of eight bars each, and the shortest notes are quavers.

GIJO'N, a fortified town and seaport of Spain, in the province of Oviedo (the former Asturias), and 20 miles north-north-east of the town of that name, stands on a low peninsula projecting northward into the Bay of Biscay. It is the best and most regularly built town in the province; is partly surrounded by old walls, and is defended by an old castle and by coast batteries. It has a good port, at which steamers call regularly. There are manufactures of stone-wares, hats, and linen fabrics; nuts and other fruits are exported. Bermudez, the historian of Spanish art, was born here. In 718, the Moors having been defeated at the battle of Canicas, were compelled to abandon G., of which they had made themselves masters. Pop. 6100.

GIL, San (sometimes called *St Giles*), a small town of the republic of New Granada, in the department of Boyaca, stands in lat. 6° 25′ N., and in long. 73° 40′ W., 64 miles south-west of Pamplona. It was founded in 1690, has a college and manufactures of tobacco and cotton fabrics, and a good trade in agricultural produce. Pop. 6000.

GIL, Vicente, the father of the Portuguese drama, was born about 1470, or, according to others, about 1485, whether at Guimaraes, Barcellos, or Lisbon, is disputed. In accordance with the desire of his parents, he studied jurisprudence at the university of Lisbon; but his poetical tastes soon drew him away from that science, and his inclination was possibly confirmed by the favourable reception of his first poetical essay at the court of Emanuel the Great. This was a pastoral in Spanish, which was represented before the court in 1502, to celebrate the birth of the prince who became John III. The queen, Beatrice, Emanuel's mother, was so pleased with the piece, that she wished it to be repeated at the following Christmas; but G. produced a new work for the occasion, also in Spanish, and in dramatic form; so that the introduction of the drama into Portugal coincides with the year of the birth of John III. G. continued at all the more important festivals to produce similar dramatic pieces, in the performance of which not only he and his daughter Paula, who was a distinguished actress and poet, but King John also took part. His fame spread beyond his own country, and Erasmus, declaring him to be the greatest dramatist of his time, is said to have learned Portuguese for the purpose of reading his works. At home, however, he had detractors, whom he sought to silence once at a party by composing impromptu, on a given proverb, the farce, *Inez Pereira*, which is his best piece. Complaints in his works seem to indicate that the court was not liberal enough to keep him from want in his later years. He died probably soon after 1536. His works were edited by his son in 1561, and again in 1585, after undergoing castigation by the Inquisition. It was not till our own times that a reprint of G.'s works, as complete and correct as possible, was undertaken by Barreto Feio, and Monteiro (3 vols., Hamb. 1832). Not only does G. possess historical importance as having laid the foundation of a national theatre in Portugal, but his works deserve study from their intrinsic poetical and dramatic worth. He has been called the Plautus of Portugal.

GIL POLO, Gaspar, a Spanish poet, was born at Valencia in the first half of the 16th century. While town-clerk of his native place, his talents for office became known to Philip II., who appointed him, in 1572, coadjutor to the president of the upper financial chamber of the kingdom of Valencia, and in 1580 sent him to superintend the royal patrimony at Barcelona, where he died. Before, however, his time was absorbed by business, G. had occupied himself with poetry. Besides various lyrics, and his *Canto de Turia* in praise of his native city, he wrote a continuation of Montemayor's *Diana*, under the title *Primera Parte de Diana enamorada Cinco Libros, que prosique los Sieta de Jorge Montemayor*. This work appeared first at Valencia in 1564, the same year in which another continuation of Montemayor's pastoral was given to the world by a physician named Perez. Though inferior to the original romance in invention, G.'s continuation so greatly surpasses it, as well as the other continuation, in clearness of thought and expression throughout the metrical portions, that Cervantes exempts it from the condemnation of Don Quixote's other books as deserving as much respect 'as though Apollo himself had written it.' The best edition of the *Diana enamorada* is that of Cerda, which is accompanied by a commentary on the *Canto de Turia* (Madrid, 1778; new ed. 1802). Biographers have generally confounded G. with a son of his own name, who was a distinguished writer on jurisprudence.

GI'LA, Rio, a river of North America, has its origin in the state of New Mexico, in lat. about 32° 45′ N., long. about 108° 30′ W.; and, after a westward course of nearly 450 miles, joins the Colorado, about 70 miles above the fall of that river into the Gulf of California. For more than one-half of its course it passes through mountains, and in some places is wholly inaccessible, being imprisoned within walls of perpendicular rock nearly 1000 feet high. The G. is navigable for flat boats for about 180 miles. Numberless ruins of stone-built houses, among which fragments of pottery are found, occur all along the banks of this river, proving that at some past period the district must have been much more populous than it now is. One of these ruins, a structure of three stories in height, is still in a good state of preservation.

GILBERT, William, a distinguished natural philosopher and physician, was born in 1540 at Colchester, of which town his father was recorder. He was a member, and subsequently fellow of St John's College, Cambridge; was B.A. in 1560, M.A. in 1564, and M.D. in 1569. About the year 1573, he settled in London, joined the College of Physicians, and practised with so much reputation, that he was appointed physician to Queen Elizabeth. The time that he could spare from the duties of his profession was employed in philosophical experiments, particularly in relation to the magnet; and in these he was assisted by a pension from the queen. After holding various offices in the College of Physicians, he was finally elected its president in 1600. At the death of the queen, he was continued in his office of court physician by James I., but he survived his royal mistress only a few months, and died a bachelor in November 1603. His death seems to have taken place in London; but he was buried at Colchester, in the church of the Holy Trinity, where there is a handsome monument to his memory. He left his library, globes, instruments, and cabinet of minerals to the College of Physicians. From his birthplace, he is generally designated as Gilbert of Colchester. His works are (1) *De Magnete, Magneticisque Corporibus, et de Magno Magnete, Tellure, Physiologia Nova*, fol., Lond. 1600 (reprinted at Stettin in 1633), of which there are several editions; (2) *De Mundo nostro Sublunari Philosophia Nova*, 4to, Amsterdam, 1651 (published from a MS. in the library of Sir William Boswell). The first of these works has served as the basis of most subsequent investigations on terrestrial magnetism; and (to use the words of Professor Whewell in his *History of the Inductive Sciences*) it 'contains all the fundamental facts of the science, so fully examined, indeed, that even at this day we have little to add to them.' He establishes the magnetic nature of the earth, which he regards (as the title of his work indicates) as one great magnet; and he conjectured that terrestrial magnetism and electricity were two allied emanations of a single force; a view which was only demonstrated with scientific strictness more than two centuries afterwards by Oersted and Faraday. G. was the first to use the terms 'electric force' and 'electric attraction,' and to point out that amber is not the only substance which when rubbed attracts light objects, but that the same faculty belongs to the resins, sealing-wax, sulphur, glass, &c.; and he describes how to measure the excited electricity by means of an iron needle moving freely on a point. Galileo pronounced him 'great to a degree that might be envied;' and the publication of his treatise *De Magnete* will always be regarded as constituting an epoch in the history of magnetism and the allied sciences.

GI′LBERT ISLANDS, a group on the south-west coast of the archipelago of Tierra del Fuego, offer a good harbour in Doris Cove.—Another cluster of the same name, comprising 15 coral islands, forms part of the Mulgrave Archipelago in the Pacific, between lat. 1° S. and 2° 30′ N., and long. 172° and 174° 30′ E., and contains a population of 60,000. The two largest are known as Drummond's Isle and Knox's Isle; the former 30 miles long by rather more than ½ mile broad, the latter 20 miles long. The inhabitants resemble the Malays in appearance, and are divided into three classes—chiefs, landholders, and slaves. The chief, almost the only, cultivated products are the cocoa-nut and the pandanus.

GI′LBERTINES, a religious order in the Roman Catholic Church, specially noteworthy as being of English origin. It was founded in the twelfth c. by St Gilbert, a native of Sempringham, in Lincolnshire. The rule of the order was mainly derived from that of the Canons Regular of St Augustine. St Gilbert also founded an order of nuns after the Benedictine institute. Both orders were approved, and had numerous convents in England at the time of the Reformation, when they shared in the general suppression.

GILBO′A, a Hebrew word signifying 'bubbling fountain,' is the name given in the Old Testament to a range of hills, between 500 and 600 feet high, overhanging the city of Jezreel, in the eastern side of the plain of Esdraelon. It is memorable as the scene of the defeat and death of King Saul and his three sons.

GILD. See GUILD.

GILDAS, or **GILDUS**, by some surnamed the Wise, by others Badonicus, appears to have been born in the year 516. He visited France in 550, and Ireland in 565. He died in 570. His *De Excidio Britanniæ Liber Querulus* was first printed at London in 1525, and has been often reprinted both in England and on the continent. The best editions are Mr Stevenson's, published by the English Historical Society (Lond. 1838), and Mr Petrie's in the *Monumenta Historica Britannica* (Lond. 1848). G. is a weak and wordy writer. Gibbon has justly described him in a single sentence: 'A monk, who, in the profound ignorance of human life, has presumed to exercise the office of historian, strangely disfigures the state of Britain at the time of its separation from the Roman empire.' His obscure and meagre narrative may be divided into two periods—the first extending from the first invasion of Britain by the Romans to the revolt of Maximus, at the close of the 4th c.; the second, from the revolt of Maximus to the author's own time. The second portion is even more unsatisfactory than the first.

GILDING. There are many processes of gilding, varying with the nature of the substance to be gilded, and the kind of effect required to be produced, but they may all be classified under three heads—namely, 1st, mechanical gilding; 2d, chemical gilding; 3d, encaustic gilding.

The first is used chiefly for gilding wood, plaster of Paris, and other compositions, in imitation of wood-carving. It consists simply in laying leaf-gold upon the surface of the article, which is first prepared with a layer of *thin white*, composed of hot size and whiting; then, if the gilding is to be burnished, another layer of *thick white* of similar composition, but with more whiting, is added; after this, a coating of gold-size (see GOLD-SIZE) is brushed over; this is wetted, and the gold-leaf is laid upon it. A considerable amount of skill is required in picking up, cutting into the proper size, and laying on the pieces of gold-leaf, so that there shall be as little waste as possible, and all the inequalities of a raised design equally covered. The gold-leaves are first spread upon a cushion by blowing them from between the leaves of a book, then cut into the required sizes, and lifted and laid on the work by means of a *tip*, which is a sort of comb formed of bristles. When the gold is thus laid on, it is forcibly blown to expel as much as possible of the moisture under it, and then further pressed and smoothed by means of a camel-hair brush. When it has reached a certain state of dryness, it is burnished by rubbing with a burnisher of flint or agate. The use of the under-layer of whiting and size is to give a somewhat yielding surface, which renders it possible to rub the gold-leaf briskly with the burnisher without abrading it. Portions of the surface which are left unburnished in dead-gold are called the *matt.* The above process is called *burnish gilding.* Oil gilding differs somewhat from this in the preparation of the surface to receive the gold-leaf. Two or three coatings of thin white, mixed with a little mellow clay, are applied; then two or three coats of plain gelatine-size, called *clear cole;* and finally, the oil gold-size (see GOLD-SIZE), upon which the gold is laid when it is nearly dry or *taccy.* Those parts which require burnishing are treated as before described. *Japan gilding* will be described under JAPANNING.

Chemical gilding.—Metals are now usually gilded by the process of electro-gilding (see GALVANISM), but besides this, various methods of chemical gilding have been adopted, and some are still in use.

Water gilding, as it is very inappropriately termed, is conducted by applying to the surface to be gilded a thin coat of an amalgam of gold, and then by heat driving off the volatile mercury, when the gold remains adhering firmly to the surface, but having a dull and dingy brownish-yellow colour. The colour and lustre of gold is brought up by *scratching* with a wire-brush, or burnishing with a bloodstone, or black hæmatite burnisher. The amalgam of gold is made by dissolving leaf-gold or precipitated gold in about ten times its weight of mercury, and then washing and straining it through wash-leather. The surface to be gilt is usually prepared by dipping it in a solution of nitrate of mercury, or *quick-water*, after it has been well cleaned; this coats it with a film of mercury, and insures adhesion of the amalgam. Water gilding is very injurious to the men and women who work at it, on account of the mercurial fumes. Modern improvements in the construction of the furnace, where the 'drying off' is conducted, have diminished this evil considerably, and at the same time economised the process by recondensing and saving the evaporated mercury; but still, with the best arrangements, the health of the water gilders is affected. This process is only applicable to metals that readily form an amalgam with mercury. Iron and steel, therefore, cannot be directly gilded by it. It is still in use for buttons and some kinds of common jewellery. Thirty thousand buttons, one inch in diameter, may be gilded with one ounce of gold; 14 or 15 thousand is the number over which this quantity is commonly spread.

Gilding by immersion.—For this purpose a solution is used which slowly attacks the metal to be gilded, and at the same time deposits on its surface an equivalent of gold. Elkington's patent solution is made by dissolving ¼ ounce troy of fine gold in 2½ ounces of nitro-muriatic acid, heating this until red and yellow vapours cease to be evolved, then diluting with 1½ pint of distilled water, adding to this 1 pound of bicarbonate of potass, and boiling for two hours. The article to be gilded is dipped into this at nearly the boiling heat, and agitated in it for about a minute. Talbot's patent solution is made by adding a solution of gold to a solution of gallic acid in water, alcohol, or ether. The articles are dipped as above.

The method called *Grecian gilding* is a process intermediate between the above and water gilding. Sal ammoniac and corrosive sublimate are dissolved in nitric acid, and gold is dissolved in this solution, which thus becomes a mixture of chloride of gold and nitrate of mercury with some ammonia. This solution, on being applied to a surface of silver, immediately blackens it, but upon the application of heat, it is richly gilded.

Most articles that are gilded by either of the above chemical methods, or by electro-gilding, are submitted to an after-process of *colouring*. This consists either in acting upon the surface with a saline solution, and heating the article afterwards, or in coating it with a kind of varnish of bee's-wax and yellow-ochre, and then burning it off. Various saline solutions are used, many of which are carefully guarded trade secrets. 1 oz. alum, 1 oz. of common salt, and 2 oz. nitre dissolved in half a pint of water is recommended. Also 24 parts of nitre, 10 alum, 5 sulphate of iron, 5 sulphate of zinc boiled together in sufficient water to form a paste when cooled with continual agitation. The articles are immersed in this, and then heated till the desired colour is obtained.

Cold Gilding.—For this a gilding powder is first prepared by dissolving 5 drams of pure gold and 1 dram of copper in 10 oz. of nitro-muriatic acid, then moistening clean linen rags with the solution, and burning them to ashes. These ashes contain finely divided gold, which may be applied to surfaces of copper, brass, or silver, by simply rubbing it over them with a piece of cork moistened with a solution of common salt in water.

Sword-blades, lancets, and other steel articles are gilded in fancy devices by drawing the design with a camel's-hair pencil moistened in a solution of gold, prepared by agitating ether with a solution of terchloride of gold, and decanting the light liquid which floats on the top. Naphtha may be used in the same manner for this purpose, and is much cheaper.

Silks, satins, ivory, bone, &c., may easily be gilded by immersing them in a neutral solution of 1 part of terchloride of gold to 4 or 5 of water, and then exposing them to the action of hydrogen gas, which readily combines with the chlorine, and reduces the gold to the metallic state. Flowers, and other ornamental designs, may be thus produced in gold by simply painting them on the surface with a camel's-hair brush dipped in the gold solution. The articles may then be suspended in an inverted tumbler or other suitable vessel, which, if placed over a bottle containing dilute sulphuric acid and iron filings or zinc scraps, will collect sufficient of the light gas to bring out in a few minutes a beautiful and permanent pure gold surface.

Encaustic gilding is usually applied to glass and porcelain. The gold is first obtained in a finely divided state by precipitating from the chloride with protosulphate of iron, or by simply heating the chloride. This powder is ground up with $\frac{1}{12}$ of its weight of oxide of bismuth and some borax and gum water, and then painted on the ware. It is then heated till the borax is vitrified and the gold thereby fixed. Sometimes the gold is ground with turpentine, or an amalgam of gold is used. It has a brown dingy appearance when it leaves the kiln; the gold lustre is brought up by burnishing.

GILDING METAL. The metal of which gilded goods are made, is required to have as nearly as possible the colour of gold, so that when the surface-gilding is worn off at the more exposed parts, the difference of colour will not be readily apparent. This is obtained by making a kind of brass having a much larger proportion of copper than in common brass.

The following are three receipts from among a variety in use: 1st, 6 parts copper, 1 common brass; 2d, 4 parts copper to 1 Bristol brass; 3d, 13 parts copper, 3 parts brass, 12 parts tin. The last is much harder than No. 1 or 2.

GI'LEAD (in Eng. 'region of rocks') was a mountainous district on the east side of the Jordan, bounded on the N. by the river Hieromax (the modern *Sheriat-al-Mandhûr*), which separated it from the rich levels of Bashan; on the E. by the desert table-lands of Arabia; on the S. by Moab and Ammon; and on the W. by the Jordan. In spite of its name, the vegetation is luxuriant, especially in the middle, and round the brook Jabbok, where forests of oak and terebinth occur. The hills are not very high; they have broad summits almost like table-lands, 'tossed,' says Professor Stanley (*Sinai and Palestine*), 'into wild confusion of undulating downs.' G. anciently produced gums and spices. It was given by Joshua to the tribes of Gad and Reuben, because of the multitude of their cattle, and as a frontier land was much exposed to invasion.

GILFI'LLAN, George, critic and essayist, was born at Comrie in 1813. He studied at the university of Glasgow, and at the divinity hall of the Secession body, afterwards the United Presbyterian Church, and in 1835 he was licensed to preach the gospel. In March 1836 he was ordained to the School Wynd Church, Dundee. His works are numerous. They display a rich but reckless fancy, and wide literary sympathies, although deficient perhaps in refinement of taste. The principal are, *A Gallery of Literary Portraits* (1845); a second *Gallery* (1849); *The Bards of the Bible* (1850); *The Martyrs, Heroes, and Bards of the Scottish Covenant* (1852); a third *Gallery of Literary Portraits* (1854); *History of a Man* (1856); *Christianity and Our Era* (1857); and *Alpha and Omega* (1860). In 1853 he commenced an edition of the *British Poets*, published by Nichol of Edinburgh, which extended to 48 vols. His contributions to periodicals have been numerous.

GILL (Low-Lat., *gilla*, a drinking-glass), a measure of capacity, containing the fourth part of a pint, or the 32d part of a Gallon (q. v.).

GILLE'NIA, a genus of plants of the natural order *Rosaceæ*, sub-order *Spiræeæ*; perennials, natives of the temperate parts of North America. The roots are used in medicine as a mild emetic, and in small doses as a tonic; and are often called Indian Physic, sometimes *American Ipecacuanha*, *Indian Hippo*, *Dropwort*, and *Bowman's Root.* They are sometimes planted in shrubberies, on account of their graceful foliage. They grow to the height of about two feet.

GILLES, St, an old town of France, in the department of Gard, is situated near the borders of the department of Bouches du Rhone, on the Canal de Beaucaire, 12 miles south-south-east of Nimes. Its abbey church, the west front of which is a master-piece of Romanesque architecture, and is covered with the richest decoration, dates from the 11th c., and is the most notable building in the town. The neighbourhood of St G. produces a strong red wine which is exported. Pop. 5730.

GILLIES, John, LL.D., known as a classical historian, the son of Robert Gillies, Esq., was born at Brechin, Forfarshire, January 18, 1747. His youngest brother, Adam, was a judge of the court of session in Scotland, under the title of Lord Gillies. G. was educated at the university of Glasgow; and, after a time, took up his residence in London, with the view of following literature as a profession. He subsequently acted for several years as travelling tutor to the sons of John, second Earl of Hopetoun, who in 1777 settled upon him an annuity for life. In 1778 he published a translation of the *Orations of Isocrates and those of Lysias, with some Account of their Lives*, 4to; and in 1786 appeared the first part of his *History of Ancient Greece.* This work forms 2 vols. 4to, and 4 vols. 8vo. It was extremely popular on its first appearance, and is really far from being a discreditable performance, though much disfigured by verbosity, and dull and prolix disquisition; but it has dropped out of notice nearly altogether since the advance of Greek scholarship in the present century, and the publication of the histories of Thirlwall and Grote. His *View of the Reign of Frederick II. of Prussia* appeared in 1789, 8vo. In 1793, on the death of Dr Robertson, he was appointed historiographer to the king for Scotland, with a yearly salary of £200. His other works are, a translation from the Greek of *Aristotle's Ethics and Politics: comprising his Practical Philosophy, with Notes, the Critical History of his Life, and a new Analysis of his Speculative Works*, 2 vols.; *Supplement to the Analysis of Aristotle's Speculative Works* (1804); *History of the World from Alexander to Augustus*, 2 vols., 4to (1807—1810); *Translation of Aristotle's Rhetoric* (1823). He died February 5, 1836.

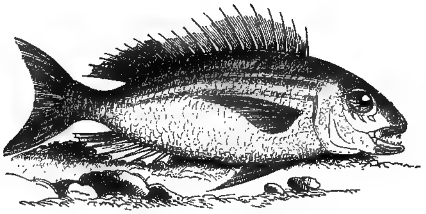
GILLS. See RESPIRATION, ORGANS AND PROCESS OF.

GI'LLYFLOWER, a popular English name for some of the cruciferous plants most prized for the beauty and fragrance of their flowers, as wallflower, stock, &c. The clove-pink also, the wild original of the carnation, is called *Clove-Gillyflower.* The name G. has been regarded as a corruption of *July-flower;* but in Chaucer it appears in the form *gilofre;* and the French *giroflée* indicates the true derivation from *girofle*, a clove, the smell of the Clove-G. being somewhat like that of cloves.

GILO'LO, or **ALMAHERA**, one of the Moluccas or Spice Islands, and the chief of a group of the same name, is crossed by the equator in long. 128° E. In its general outline it bears a vague resemblance to its western neighbour Celebes, from which it is separated by the Molucca Passage, both of them being as unlike in form to any other island as they are like to each other. It is divided towards the east from New Guinea by a wide channel of its own name. It contains about 6500 square miles, comprising several petty states, which are connected chiefly with the Dutch settlements in the East Indies. The imports are manufactured goods, opium, china-ware, and iron; and the exports are sago, cocoa-nuts, spices, fruits, pearls, gold-dust, horses, sheep, and horned cattle. The interior is mountainous, and in many parts densely wooded.

GILRAY, JAMES, a celebrated caricaturist, born in London about the middle of last century. He first became known as a successful engraver about 1784, and between 1779 and 1811 issued as many as 1200 caricatures, numbers of which, it is said, 'were etched at once upon the copper without the assistance of drawings.' They are full of broad humour and keen satire, the subjects of his ridicule being generally the French, Napoleon, and the ministers, though he often diverged to assail the social follies of his day. He died 1st June 1815. G.'s drawings have often been published, but the best edition is that of M'Lean (accompanied by an illustrative description), in 304 sheets (Lond. 1830). More recently, an edition has been issued by Bohn.

GILTHEAD (*Chrysophrys*), a genus of acanthopterous fishes of the family *Sparidæ*, having a deep compressed body, a single dorsal fin, the anterior rays of which are spinous, the cheeks and gill-covers covered with scales, the teeth of two kinds, six conical teeth in front of each jaw, and four rows of oval rounded grinding-teeth in the upper jaw, three rows in the lower. They feed chiefly on molluscs, the shells of which their teeth enable them to crush to pieces. The species are numerous; inhabitants of the warmer seas. One species, the COMMON G. (*C. aurata*), is found, but rarely, on the British coasts; it abounds in the Mediterranean, and is very much esteemed for the table. It seldom attains a length of more than twelve inches. It is generally found near the shore, in small shoals, and its presence is sometimes betrayed to fishermen by the noise which its teeth make in crushing shells. It is said to agitate the sand with its tail, in order to get at the molluscs concealed in it. The back is silvery gray, shaded with blue; the belly like polished steel; the sides have golden bands; and there is a half-moon-shaped golden spot between the eyes, from which it derives the name G., the Latin name *Aurata* (gilded), and the Greek name *Chrysophrys* (golden eyebrow). From the Latin *Aurata* comes the French name *Dorade.* This fish was very generally kept in the *vivaria* of the ancient Romans, being much valued and easily fattened. Another species (*C. microdon*) is also found in the Mediterranean.—The name G. is also given to a British fish of a different family (*Labridæ*), a species of Wrasse (q. v.).



Common Gilthead (*Chrysophrys aurata*).

GILT TOYS. This term is known in trade as a designation for small articles which are gilded, but is chiefly applied to the cheap jewellery which is almost exclusively manufactured at Birmingham. In that town this trade is very extensive, and employs thousands of persons and a considerable amount of machine power. Cheap jewellery of the most elegant forms is made from copper, which is drawn through rollers for the purpose, into small ribbons and wires, with elegantly embossed surfaces to represent the fine chasing employed on articles made from the precious metals. These the gilt-toy maker twists and solders into brooches, bracelets, rings, and a variety of trinkets, usually with a raised *bezell* for receiving a piece of polished coloured glass, or a cheap stone. Previous to setting the glass or stone, the trinkets are strung on copper wires, and sent to the electro-plater, who gives them a coating of gold or silver, and returns them to the gilt-toy maker, who finishes them by burnishing and by setting the imitation gems. In this way really beautiful imitation jewellery is produced at an incredibly small cost; and being coated with the precious metals in the pure state in which they are deposited by the electro-plating process, their spurious character is not easily detected by the uninitiated.

GI'MBALS (Lat. *gemellus*, a twin), are two circular brass hoops used for suspending the compass-box on board ship, so that it may always rest horizontally, unaffected by the ship's motion. The outer hoop is attached to a box or other fixed object, while the inner is constructed so as to allow of its moving freely within the outer, to which it is attached by two pivots at the extremities of a diameter. The compass-box is attached to the inner hoop by two similar pivots at right angles to the former. Thus, the compass moves freely in two directions at right angles to each other, and can always retain its horizontal position, however the vessel may roll or pitch. G. are often applied to other instruments, such as the mountain barometer, &c.

GI'MBLET, a tool for boring holes in wood to receive nails, screws, &c., and generally used when the hole is to be larger than can be bored with a brad-awl. It has a conical screw point, followed by a groove for clearing, and is fitted in a cross or T handle. An improvement has lately been made by twisting the grooved part of the gimblet, so that it forms a long spiral groove.

GIME'NA, or **XIMENA**. See JIMENA.

GIMP, or **GYMP**, a kind of trimming for dress, curtains, furniture, &c., made either of silk, wool, or cotton. Its peculiarity is that fine wire is twisted into the thin cord of which it is made.

GIN is a machine used for raising weights, driving piles, &c., and consists of three poles, each from 12 to 15 feet long, and 5 inches in diameter at the lower end, tapering to 3½ inches at the upper. The poles are united at the top, either by an iron ring which passes through them, or by a rope which is twisted several times round each, and to this 'joint' a pulley is fixed. Two of the poles are kept at an invariable distance by means of an iron rod, in order that they may support the windlass which is attached to them, its pivots running in iron cheeks fixed to the poles. When the machine is to be used, it is set up over the weight to be raised; two blocks arranged according to the Second System of Pulleys (q. v.) are fixed, one to the top of the poles, the other to the weight; and the rope, after passing round both blocks, and over the pulley before-mentioned, is attached to the windlass, by the revolution of which the weight can then be raised.—The name of Gin is also given to a machine used for raising coal, &c., and also for communicating motion to thrashing-mills. It consists of an erect axis or drum, firmly fixed in sockets, to which are attached transverse beams, varying in number according to the power required. To the extremity of each beam a horse is yoked, and they are then driven round in a circle. If coal is to be raised, the horses must either be frequently unyoked, and turned in the opposite way, or the machine must be made reversible; the latter of which is found to be preferable, as a saving both of time and labour. This machine is now rapidly disappearing before the steam-engine.

GIN is a machine used for disentangling the fibres of Cotton (q. v.).

GIN, or **GENEVA**, an alcoholic drink, distilled from malt or from unmalted barley or other grain, and afterwards rectified and flavoured. The gin, which forms the common spirituous drink of the lower classes of London and its vicinity, is flavoured very slightly with oil of turpentine and common salt; each rectifier has his own particular recipe for regulating the quantities to be used; but it is usually about 5 fluid ounces of spirit of turpentine and 3½ lbs. of salt mixed in 10 gallons of water; these are placed in the rectifying still, with 80 gallons of proof corn-spirit, and distilled until the feints begin to come over. It is then used either unsweetened or sweetened with sugar.

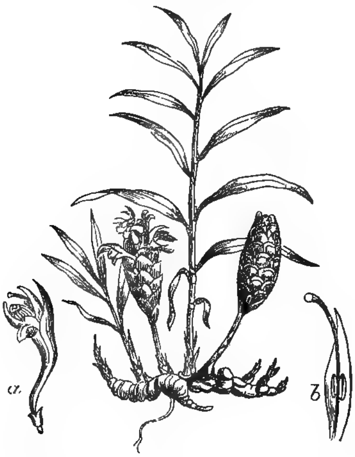
We derive the terms gin and geneva from the Dutch, who call the Hollands-gin (which is their national spirit) *giniva*, which they have derived from the French *genièvre*, juniper. The origin of this name is, doubtless, to be found in the employment of juniper-berries in flavouring the spirit made from unmalted Riga rye in Holland, where it is an article of great manufacture, chiefly at Schiedam; hence it is often called *Schiedam* or Hollands, as well as geneva and gin. So extensive is the manufacture of this spirit in Holland, that in Schiedam alone there are 175 distilleries, employing nearly 1000 men, besides which there are 30 more distilleries in Gouda, and 17 in Amsterdam, and others scattered about the country. Notwithstanding this immense manufacture of alcohol, the Dutch are by no means an intemperate people: the fact is, the larger part by far of the spirit made in Holland is exported to other countries, especially to North America and Northern Europe. It was formerly always exported in bottles, but casks are now much used as well. The chief manufactories of gin in England are those of Messrs Booth and Messrs Smith and Nicholson, in London; Messrs Coates and Co., at Plymouth; and one or two large distilleries in Bristol.

Perhaps nothing used as diet by man is liable to greater and more injurious adulteration than gin. Almost every gin-shop keeper in London has some vile recipe for increasing the pungency and giving a factitious strength to the much diluted sweetened spirit sold under this name. A mere enumeration of the articles usually employed will give some idea of the extent to which sophistication is carried on with this spirit: roach alum, salt of tartar (carbonate of potash), oils of juniper, cassia nutmeg, lemons, sweet fennel, and caraway; coriander seeds, cardamoms, and capsicums; and worse than all, creasote, which is most injurious. It is said that sulphuric acid is even added, but this is by no means probable.

GI'NGAL, a weapon used by Asiatic armies in the defence of fortresses. It may be described as a large and rude musket, which is fired from a rest. The Chinese employ it to a considerable extent.

GI'NGEE is one of the Virgin Islands—the group at the north-east bend of the grand arch of the West Indies.

GINGER (*Zingiber*), a genus of plants of the natural order *Scitamineæ* or *Zingiberaceæ*, having the inner limb of the perianth destitute of lateral inner lobes, and the fertile stamen prolonged beyond the anther into an awl-shaped horn. The species are perennial herbaceous plants, with annual stems, and creeping root-stocks (*rhizomes*); the stems produce leaves in two opposite rows; the flowers are in compact spikes with bracts. They are natives of the East Indies. The root-stocks of most of the species are used as a condiment and in medicine. The most valuable and generally used are those of the COMMON G. (*Z. officinale*), sometimes distinguished as the Narrow-leaved G., which has been cultivated in the East Indies from time immemorial, and is now also cultivated in other tropical countries, particularly the West Indies and Sierra Leone, from both of which, as well as from the East Indies, its root-stocks—the ginger of commerce—are a considerable article of export. The root-stock is about the thickness of a man's finger, knotty, fibrous, and fleshy when fresh. The stems which it sends up are reed-like, invested with the smooth sheaths of the leaves, generally three or four feet high. The leaves are linear-lanceolate and smooth. The flowers are not produced on the leafy stems, but on short leafless stems (scapes), in spikes about the size of a man's thumb, and are of a whitish colour, the lip streaked with purple. The cultivation of G. is extremely easy wherever the climate is suitable. In India it is carried on to an elevation of four or five thousand feet on the Himalayas, in moist situations. The root-stock is taken up when the stems have withered, and is prepared for the market either by seething and scalding in boiling water—in order to kill it—and subsequent drying, or by scraping and washing. The first method yields *Black G.*, the second *White G.;* the blackest of Black G., however, being only of a stone colour, and the whitest of White G. very far from perfectly white, unless bleaching by chloride of lime be afterwards employed, as it not unfrequently is, to improve its appearance, a process not otherwise advantageous. There is a considerable difference, however, in the original colour of the root-stock in the G. of different countries, which is supposed to be owing to difference in the varieties cultivated. The uses of G. both in medicine, as a stimulant and carminative, and in domestic economy, as a condiment, are too well known to require particular notice. Its qualities depend very much on a pale yellow volatile oil, lighter than water, called *Oil of Ginger.* It contains also a considerable quantity of starch.—*Candied G.*, or *Preserved G.*, consists of the young root-stocks preserved in sugar, and is now imported in considerable quantity from China, as well as from the East Indies and from the West Indies. It is a delicious sweetmeat, and is useful also as a stomachic.—*Essence of G.*, much used for flavouring, is in reality a tincture, prepared of G. and alcohol.—*Syrup of G.* is used chiefly by druggists for flavouring.—*Ginger Tea* is a domestic remedy very useful in cases of flatulence, and is an infusion of G. in boiling watet.—*Ginger-beer* (q. v.) is a well-known beverage, flavoured with ginger.—*Ginger Wine* (q. v.) is a cheap liqueur flavoured with ginger.—G. was known to the Romans, and is said by Pliny to have been brought from Arabia.—Another species of G. is Zerumbet (*Z. zerumbet*), also called Broad-leaved G., cultivated in Java, and of which the root-stock is sometimes erroneously called Round Zedoary. The root-stock is much thicker than that of common G., and is less pungent.—The root-stock of the Cassumunar (*Z. cassumunar*), sometimes called Yellow Zedoary, has a camphor-like smell, and a bitter aromatic taste. It acquired a high reputation as a medicine in England and throughout Europe about the close of the 17th c., but having been extolled not merely as a stimulant and stomachic, but as possessing virtues which did not in reality belong to it, it soon sunk into oblivion.—The root-stock of the Mioga (*Z. mioga*) is less pungent than G., and is much used in Japan.—Cattle sent to graze in the jungles of Northern India, during the rainy season, are supplied with the root-stocks of a species of G. (*Z. capitatum*), to preserve their health.—The root of *Aristolochia* (q. v.) *Canadense* is sometimes called *Indian G.* or *Wild G.* in North America, and is used as a substitute for ginger. It has a grateful aromatic odour and taste, and is stimulant, tonic, and diaphoretic.



Common Ginger (*Zingiber officinale*):
a, a flower, detached; *b*, perfect anther.

GINGER-BEER. An effervescing drink made by fermenting ginger, sugar, and some other ingredients, and bottling before the fermentation is completed. The following recipes are amongst the best known: Lump sugar, 5 lbs.; crushed Jamaica ginger (the unbleached is best), 5 oz.; cream of tartar, 4 oz.; 10 lemons, sliced; and 5 gallons of boiling water. They should be mixed in a vessel which can be kept covered until cool, but require stirring from time to time as the cooling goes on. When lukewarm, add 10 oz. of yeast, and keep it in a warm place to encourage the fermentation, which soon commences; after one day's fermentation, strain through a flannel filter, and let it stand to ferment again for a short time; then take off the scum, and bottle. The bottle must be tied or wired down. Another recipe is: Cream of tartar, 3 oz.; ginger, 1 oz.; refined sugar, 1½ lbs.; 1 sliced lemon; 1½ gallons boiling water; 1 oz. yeast; to be treated in the same way. A spurious ginger-beer, largely used, is made by putting a few drops of tincture of ginger and a little syrup in a bottle, and filling it up with aërated water from the soda-water machine.

GI'NGERBREAD. A very well-known article of food, which has been in vogue certainly since the 14th c., when it was made and sold in Paris, according to Monteil in his *Histoire des Francais* (tom. ii. pp. 47, 48); it was then made of rye dough, kneaded with ginger and other spice, and honey or sugar. It was probably introduced to England by the court of Henry IV., and since that time has played an important part in the pleasures of young and old at the fairs and festivals of the country. Changes were no doubt wrought in its composition as soon as it appeared in this country, and the expensive honey gave way to the cheaper treacle which was then in use, and the colour was hidden under some colouring matter or gilding. 'To take the gilt off the gingerbread,' has become a proverb, and the booths glittering with their gilded array of rude devices in gingerbread, so familiar to our boyhood, still make an occasional appearance in the country fairs.

Three forms of this article are to be found in most pastry-cooks' shops, and one or more of them in the sanctum of every good housewife. 1. Square soft cakes, from two to three inches in thickness. 2. Thin cakes of various forms, but most frequently round, being stamped out with the top of a wine-glass, or other contrivance. 3. Small button-like cakes, called gingerbread-nuts. The two last should be baked very quickly, crispness being indispensable.

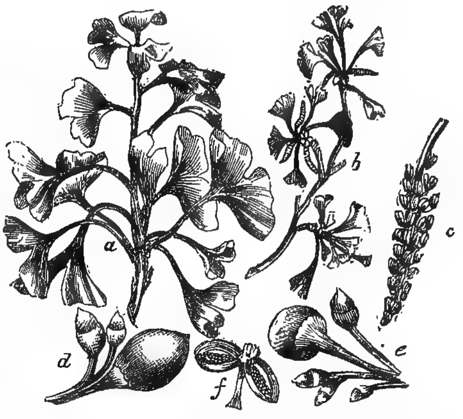
The constituents of modern gingerbread are treacle, moist sugar, wheaten-flour, and butter; a little carbonate of magnesia and tartaric acid, or carbonate of ammonia, are also put in to give lightness by many makers.

GINGER-WINE, a popular and cheap liqueur, made by the fermentation of sugar and water, and flavoured with various substances, but chiefly with ginger. It is partly an article of domestic manufacture, and is partly made on a larger scale for sale. It may be made by dissolving about six pounds of sugar in fourteen gallons of water; adding four ounces of bruised ginger and the whites of two eggs, well beaten; mixing thoroughly; boiling for a quarter of an hour; skimming carefully; and when the liquor has cooled, adding the juice of four lemons, and also their rinds for flavouring, with a tea-cupful of ale-yeast to promote fermentation; letting it ferment in an open vessel for twenty-four hours, and then putting it into a cask of suitable size, closely bunged, in which it remains for a fortnight before it is bottled. It is, however, very common to increase the strength of ginger-wine by the addition of spirits, the flavour being also modified by the kind of spirits employed. A little spirits added makes ginger-wine keep well, and it even improves in quality for many months. Its quality depends much on that of the sugar and of the ginger employed, and also on the care with which the manufacture is conducted.

GI'NGHAM. A cotton fabric originally introduced with its present name from India; it is now manufactured to an immense extent in Britain, and our manufacturers supply, to a very great extent, the Indian markets. It differs from calico in the circumstance, that its colours are woven in and not afterwards printed. At first, the Indian ginghams consisted of cotton cloths, with two or more colours arranged as a small checkered pattern; now, a great variety of designs are found in this material, and in the case of umbrella ginghams, the whole piece is woven with yarn of one colour. The following are the chief kinds of gingham known in the markets of Great Britain: plain common light grounds; plain common dark grounds; Earlston ginghams; power-loom seersuckers and checks (imitations of the Indian patterns); muslin ground (stripes and checks); furniture stripes and checks; coloured diapers; crossover stripes; derries, Hungarians; jean stripes, and umbrella ginghams.

GI'NGILIE OIL, a name often given to the bland fixed oil obtained by expression from the seeds of *Sesamum Indicum*. See SESAMUM.

GI'NGKO, or **GINKO** (*Salisburia adiantifolia*), a large tree of the natural order *Taxaceæ* (yew, &c.), with straight erect trunk and conical head, and leaves remarkably resembling the leaflets of the fronds of maidenhair, somewhat triangular, cloven and notched at the upper extremity, shortly stalked, leathery, smooth, shining, yellowish green, with numerous minute parallel ribs, and somewhat thickened margins. The fruit is a sort of drupe, of which the fleshy part is formed by the persistent calyx, about an inch in diameter; the nut or endocarp white, a thin shell with a farinaceous kernel resembling an almond in flavour, with a little mixture of austerity. The tree is a native of China, but has been long known in Europe, and large trees are now to be seen in England. The wood is easy to work, receives a fine polish, is yellowish white, veined, and not resinous. In China and Japan, the G. is grown chiefly for the kernel, which is freed from austerity by boiling and roasting. The fleshy part of the fruit, although resinous and astringent, is also eaten after being slightly roasted. The male and female flowers are on different trees, but the Chinese plant several close together, which grow into a monstrous tree, producing both male and female flowers.



Gingko Tree:
a, branchlet of female tree; *b*, branchlet of male tree, in flower; *c*, male flowers; *d*, female flowers; *e*, fruit; *f*, anther.

GI'NSENG, a root highly esteemed in China as a medicine, being universally regarded as possessing the most extraordinary virtues, and as a remedy for almost all diseases, but particularly for exhaustion of body or mind. It is sometimes sold for its weight in gold. It was once introduced into Europe, but soon forgotten. It is the root of a species of *Panax*, of the natural order *Araliaceæ*, to which the name *P. Ginseng* has been given, and which is a native of Chinese Tartary; having a stem from one foot to two feet high; leaves on long stalks, five-fingered, and almost quite smooth; and umbels on a long terminal stalk. It is doubted by many botanists if this species is really distinct from *P. quinquefolium*, a common North American plant; the root of which is now an article of export from North America to China, and is used as a domestic medicine in the states west of the Alleghanies, but which European and American medical practitioners generally regard as almost worthless. It is mucilaginous, sweetish, and slightly bitter and aromatic.—*P. fruticosus* and

Ginseng (*Panax quinquefolium*).

P. cochleatus are fragrant aromatics, growing in the Moluccas, and used by the native practitioners of India.—The fruit of the genus *Panax* is succulent, compressed, with two or three leathery one-seeded cells.

GIOBE'RTI, Vincenzo, a remarkable Italian writer and thinker of modern times, was born in 1801 at Turin. He was educated for the church, obtained his degree of doctor of theology in 1823, and was ordained to the priesthood in 1825. He was subsequently appointed professor of theology in the university of his native city, and on the accession of Charles Albert, was selected as chaplain to the court, an office which he filled with distinction till 1833. At this period of rising political agitation, G. was accused of promoting the liberal movement, was dismissed from court, and suffered an imprisonment of four months. Having obtained permission to retire into banishment, he went first to Paris, and shortly after to Brussels, where he spent eleven years as private tutor in an academy, pursuing in his leisure hours his private studies. A devout Catholic, G. looked upon the papacy as the divinely appointed agency for the elevation of Italy among the nations. A confederation of states subject to papal arbitration, and having in the king of Piedmont a military protector, was the scheme devised by G. for the unity and regeneration of his country. In short, in the 19th c. he advocated the Guelph policy of the middle ages. These views he elaborately developed in his work entitled, *Il Primato Civile e Morale degli Italiani* (The Civil and Moral Supremacy of the Italians). Its publication in Paris in 1842, during the author's exile, was hailed with the utmost enthusiasm by Italy, with the exception of a limited and far-sighted section of the country. The liberal and conciliative policy adopted by Rome on the accession of Pius IX., appeared the verification of G.'s predictions, and increased the popularity of his name. On his return to Italy, he was received with universal ovations from all classes of the people, and was honoured by being chosen by several towns as their representative in parliament. The king appointed him senator, he subsequently was elected president of the chamber of deputies, and finally prime minister; owing to the great divergence of opinion which divided his ministry, he held office only for a few weeks, and was forced to resign. His successor despatched him to Paris on some unimportant mission, in order it was thought to remove him from Turin; and thus ended G.'s political career, as from that period he filled no official position, but devoted himself exclusively to literary pursuits. As a politician, G. failed in far-sightedness; and with the course of events in Italy, his influence as a political guide inevitably declined; but the depth and range of thought and strength of conviction evinced in his various works, entitle him to the consideration and standing which as a writer he enjoys. G.'s remarkable gentleness in private intercourse bore no trace of the energetic force with which his writings propound an opinion or denounce an opponent. He died at Paris of apoplexy in 1853. His chief writings are entitled, *Introduzione allo studio della Filosofia* (Paris, 1839); *Il Primato* (Paris, 1842); *Il Gesuita moderno*, 8 vols. (Lausanne, 1847); *Il Rinnovamento civile degli Italiani* (Paris, 1851).

GIO'JA, the name of four towns of the south of Italy. The most important is in the province of Terra di Bari, 26 miles south of the town of Bari. It is a thriving industrious place, surrounded by a fine fertile territory. Pop. 14,000. It was formerly famous for the beauty of its woods, the favourite hunting-grounds of the Emperor Frederic II.

The second town is in the province of Calabria, Ultra I., situated a mile from the sea, and 28 miles north-east of Reggio. It is said to be of ancient origin, and has sustained several severe sieges. It was finally all but destroyed in 1783 by an earthquake, and now possesses only about 1000 inhabitants.—The third G. is in the province of the Abruzzi, Ultra II., 34 miles south-south-east of Aquila, and 60 from the sea, with 2409 inhabitants. Its territory, although mountainous, is productive.—The fourth is a town of 3560 inhabitants, in the province of Terra di Lavoro, 6 miles north-west of Cerreto.

GIOJA, Melchiorre, a famous Italian statistician, was born at Piacenza, 20th September 1767. He was educated for the priesthood, and for some time discharged the duties of tutor in a noble family, but through the liberality of his brother was enabled to resign this post, and to follow his own bent, which was towards social and economic science. When the invading forces of France descended into Italy, G. had already attracted much notice by his political writings; and in 1797 he quitted Piacenza for Milan, and was there appointed state historiographer, a post he was deprived of in 1803, in consequence of his work on divorce giving great dissatisfaction. In 1806, he was appointed director of the statistical department, and in 1809 the minister Vaccari intrusted to him the preparation of a grand statistical report of all Italy. This great labour was still in progress when a change of government interrupted it. G. died at Milan, January 2, 1829. His laborious habits and immense knowledge of the subjects he wrote upon, enabled him to accomplish an incredible amount of labour, but he is justly blamed for the bitter strain of personal invective with which he resented the least unfavourable criticism of his works. Some of his chief works are: *Sul Commercio de' Commestibili e caro prezzo del vitto* (Milan, 1802, 2 vols. in 12mo); *Teoria civile e penale del divorzio ossia necessità, cause nuova maniera di organizzarla* (Milan, 1803, in 8vo); *Nuovo prospetto delle scienze economiche, ossia somma totale delle idea teoriche e pratiche in ogni ramo d'amministrazione privata e pubblica* (Milan, 1815 to 1819, 6 vols. in 4to); *Filosofia della Statistica* (Milan, 1826, 2 vols. in 4to); *Dell' ingiuria, dei danni, del soddisfaci mento e relative basi di stima* (Milan, 1802, 2 vols. in 8vo).

GIOJO'SA, a town of Naples, in the province of Calabria, is situated about 7 miles north-east of Gerace, in a fertile and beautiful district, and is supposed to have risen on the ruins of the ancient city of Mitra, mentioned by Pliny. Its air is remarkable for purity, and its inhabitants for physical vigour and beauty. Pop. estimated at 8485.

GIORDA'NO, Luca, an Italian painter, was born of impoverished parents at Naples, about 1632; studied under Ribrera or Spagnoletto, and made rapid progress. Singularly enough, considering his fine imagination and delicate touch, both his early productions as well as those of his more mature years, indicate rather a power of beautifully correct imitation, than any marked originality or elevation of genius. On leaving Ribrera's school, G. repaired to Rome, where he became the scholar and fellow-worker of Pietro da Cortona. Subsequently, he went to Lombardy and Venice, to familiarise himself with the styles of the schools of art there. After some time he proceeded to Madrid, in 1692, at the request of Charles II., king of Spain, who desired his assistance in the embellishment of the Escorial. His pleasing freedom of manner and genial humour rendered him a special favourite during his residence at the Spanish court, which he only quitted for Italy on the death of the king, ten years later. The extreme rapidity of execution for which G. was remarkable, enabled him to produce a prodigious number of works, but undoubtedly told detrimentally against their excellence. With some blemishes they possess, however, many beauties, and are chiefly admired for their spirited animation of character, and harmonious freedom of treatment, they also excel in boldness and perfection of the foreshortening. The palaces Riccardi and Pitti contain some fine specimens of this artist's style, but his best paintings are in the galleries of Dresden and Naples, and the Escorial at Madrid. G. died about 1704. The name of *Fa presto*, which distinguished him through life, referred to his father's incessant injunction to *work quickly*, in order that the proceeds of his labour might relieve the indigence of the family.

GIORGIO'NE, or **GIORGIO BARBARELLI**, one of the most poetical and fascinating of Italian painters, was born about 1478 at Castelfranco, in the Venetian territory of Trevisano. He studied under Giovanni Bellini, but quickly surpassed his master; for while Bellini's style is distinguished for its minute finish and cramped precision, that of G. literally revels in freedom and breadth of outline, and gorgeous depth of colour. Unfortunately for art, G. died in 1511, at the early age of 33. His works are of course limited in number, but they are among the most rare and exquisite examples of the Venetian school. Scriptural scenes, highly original in idea and treatment, portraits, and a few sweet idyllic scenes, representing pastoral concerts and sylvan enjoyments, form the subjects of these pictures, which all glow with the fine imagination, the rich colouring, and the energy of touch, that are G.'s distinctive attributes. The Lombard galleries and the Louvre possess the best authenticated originals of G., whose imitators were numerous.

GIO'TTO, or **AMBROGIOTTO BORDONE**, a great painter, architect, and sculptor, born in 1276, was the son of a poor shepherd, and passed the earliest years of his life in watching flocks in his native Tuscan valley of Vespignano. Here he first essayed to reproduce on a fragment of slate the forms of nature surrounding him, and to the subtle influences of these early associations may be ascribed much of the devotion which G.'s perfected works evince towards nature in her purest and most winning aspects. One of these simple designs, representing a sheep, having fallen under the notice of Cimabue, the latter became interested in G., and having obtained the consent of the youth's father, received him into his studio. G.'s intuitive perception of the *true* in art speedily emancipated him from the conventionalities, although it is true that Cimabue himself had previously taken steps in this direction. In G.'s paintings, however, we first markedly observe instead of the flat elongated forms and lifeless features of the Byzantine types, figures imbued with the varied action and expression of nature, and exhibiting besides an ideal elevation and grandeur of character. He first also practised the art of grouping with due regard to the sentiment and action of the composition, and gave simplicity and grace to the draping outline; in short, he effected a profound reformation in the style of art, which from his era assumed its rightful alliance with the beautiful in nature. G. was also an eminent architect, and was employed in the execution of the dome of Florence, while from his designs the Campanile (q. v.) was built. The beloved friend of Dante, and of all the great souls of his age, he himself presented a rare union of genius, knowledge, and wit, combined with the utmost equanimity of humour and massive good sense. The restorer of portraiture, his pencil has transmitted to our day the features and personality of his cherished Dante, of Brunetto Latini, Corso Donati, and other celebrities; and in return we find his name enshrined with reverence in all the grand literary works of the times, especially in those of Dante, Boccaccio, and Petrarca. The works of this illustrious man are too numerous to be recorded here, but we may mention some of the principal. 'The Coronation of the Virgin,' in the church of Santa Croce at Florence; 'A Last Supper,' in the refectory; the famous mosaic, executed at Rome for Pope Boniface VIII., named 'La Navicella,' and representing Peter walking on the waves, a wonderful work, which has unhappily severely suffered in the successive repairs it has required; the frescoes of the 'Seven Sacraments,' painted at Naples in the church of the Incoronata, one of the most perfect of his works in point of preservation; and the frescoes of Assisi, illustrating the life of St Francis, and innumerable other minor works. G. died at Florence in 1336, and was interred in the church of Santa Maria del Fiore, where a marble monument was erected to his honour by Lorenzo de' Medici.

GIOVA'NNI (SAN) A TEDUCCIO, a town of 7298 inhabitants, three miles east of Naples, is situated near the sea-shore in a fertile plain. Its neighbourhood is well cultivated, and embellished with beautiful villas. Its origin is supposed to be very ancient, and its name is attributed to the Emperor Theodosius, whose name is carved on a small ancient column discovered in the vicinity of the town.

GIOVENA'ZZO, a thriving little town in the south of Italy, province of Terra Di Bari, is situated on the shore of the Adriatic, 14 miles west-north-west of the town of Bari. It is considered the Natiolum of the Romans, and possesses some remains of its ancient walls. In the 11th c. it belonged to the Greeks, and eventually passed into the possession of the Gonzaga family. There is here an excellently organised asylum for the poor, conjoined with extensive juvenile reformatories. G. is encircled by vineyards and rich plantations of olive, almond, and other fruit-bearing trees. Pop. upwards of 7000.

GIPSIES. See GYPSIES.

GIRA'FFE, or **CAMELOPARD** (*Camelopardalis Giraffa*), the tallest of quadrupeds, ranked by some naturalists among deer (*Cervidæ*), but more properly regarded as constituting a distinct family of ruminants, which contains, however, only one species. It is a native of Africa, from Nubia to the Cape of Good Hope, extensively diffused, but apparently nowhere abundant. It occurs generally in small herds of from five to forty. It feeds on the leaves and small branches of trees. Its general aspect is remarkable from the height of the foreparts and great elongation of the neck, the head being sometimes 18 feet from the ground. The number of vertebræ in the neck, however, is not greater than in other quadrupeds, and it has no extraordinary flexibility, although its form and movements are very graceful. The body is short, and the back slopes from the shoulder to the tail; but the greater height of the foreparts is not owing, as has been often alleged, to the greater length of the fore-legs, which are not really longer than the hind-legs, but to processes of the vertebræ, which form a basis for the muscular support of the neck and head. The articulation of the skull to the neck is such that the head can be easily thrown back until it is in the same line with the neck, thus giving the animal additional power of reaching its appropriate food. The skull has empty cavities, which give lightness to the head, along with sufficient extent of surface for the insertion of the ligament which supports it. The legs are long and slender; the feet have cloven hoofs, but are destitute of the small lateral toes or spurious hoofs, which occur in the other cloven-footed ruminants. The head is long; the upper lip entire, projecting far beyond the nostrils, and endowed with considerable muscular power. The tongue is remarkably capable of elongation, and is an organ of touch and of prehension, like the trunk of an elephant; it can be thrust far out of the mouth, and employed to grasp and take up even very small objects; it is said that its tip can be so tapered as to enter the ring of a very small key. The usefulness of such an organ for drawing in leaves and branchlets to the mouth is obvious. The G. adroitly picks off the leaves of acacias and other thorny plants, without taking the thorns into its mouth. The dentition of the G. agrees with that of antelopes, sheep, goats, and oxen; the upper jaw of the male is destitute of the canine teeth, which are present in the male of most kinds of deer. The head is furnished with two remarkable protuberances between the ears, generally described as horns, but very different from the horns of other animals, and each consisting of a bone united to the skull by an obvious suture, permanent, covered with skin and hair, and terminated by long hard bristles. There is also a projection on the forehead. The ears are moderately long; the tail is long, and terminates in a tuft of long hair that nearly reaches the ground. There is a callosity on the breast. The neck has a very short mane. The hair is short and smooth; the colour is a reddish white, marked by numerous dark rusty spots. The eye of the G. is very large and lustrous, and so placed that the animal can look all around without turning its head, so that in a wild state it is not easily approached. Its nostrils have a muscle by which they can be closed; a provision, as Owen supposes, for excluding particles of sand. It is an inoffensive animal, and generally seeks safety, if possible, in flight, although it is capable of making a stout resistance, and is said to beat off the lion. It fights by kicking with its hind-legs, discharging a storm of kicks with extraordinary rapidity. It is not easily overtaken even by a fleet horse, and has greatly the advantage of a horse on uneven and broken ground. Its pace is described as an amble, the legs of the same side moving at the same time. The G. was known to the ancients, and was exhibited in Roman spectacles. Representations of it appear among Egyptian antiquities. It has been supposed to be the *zemer* of the Jews, translated *chamois* in the English Bible (Deut. xiv. 5). In the year 1836, giraffes were added to the collection in the Zoological Gardens of London, and interesting opportunities of studying their habits have since been enjoyed. They are fed chiefly on hay placed in high racks, greatly enjoy carrots and onions, and a lump of sugar is a favourite delicacy. They have bred in England. The flesh of the G. is said to be pleasant, and its marrow is a favourite African delicacy.

Giraffe.

GIRA'LDUS CAMBRE'NSIS, the literary name of Gerald de Barri. He was fourth son of William de Barri, a Norman noble who had settled in Pembrokeshire, and allied himself by marriage to the family Rhys ap Theodor, prince of South Wales. G. was born about 1146, and educated by his uncle David, who was Bishop of St David's. He entered the university of Paris in his 20th year, and after three years of much literary distinction he returned to England, entered into holy orders in 1172, and was soon afterwards appointed Archdeacon of St David's. He was from the first a zealous churchman; strenuous in the enforcement of discipline, and especially of clerical celibacy; and was the chief agent in the establishment of the payment of tithes within the principality. On the death of his uncle, the chapter of St David's elected him bishop; but as the election was made without the royal license, G. renounced it. The king, Henry II., directed a new election; and on the chapter's persisting in their choice of G., the king refused to confirm the selection, and another bishop, Peter de Leia, was appointed. G. withdrew for a time to his old residence in the university of Paris, and on his return he was required, by the Archbishop of Canterbury, to take the administration of the diocese of St David's, which had utterly failed in the hands of De Leia. He held it for four years, when being appointed a royal chaplain, and afterwards preceptor to Prince John, he accompanied that prince in 1185 in his expedition to Ireland, where he remained after John's return, in order to complete the well known descriptive account of that country, which, although very valuable as a whole, has in many of its details called forth much angry criticism from Irish scholars and antiquaries. On his return, in 1187, he read this work publicly in the university of Oxford, giving a full day to each of the three divisions of which it consists. A tour of Wales which he made (1188) in the company of Baldwin, Archbishop of Canterbury, led to a similar descriptive work, the *Itinerarium Cambriæ*. In the following year he accompanied the king to France, where he remained till the king's death. His later years, after his return, were full of disappointment. On the see of St David's again becoming vacant, he was again unanimously elected by the chapters; but the Archbishop of Canterbury having interposed, G., notwithstanding an appeal to Rome, in prosecuting which he made three different journeys in the course of five years of the contest, failed to obtain a confirmation of the nomination. He soon afterwards resigned his archdeaconry, and devoted the remaining seventeen years of his life to study. Once again the see of St David's became vacant, but although it was offered to G. on certain conditions, he declined to accept it, and died at St David's in the 74th year of his age. The reason why G.'s appointment to the bishopric was so much opposed is not clearly known, but the king, it is said, had resolved that no native of Wales should obtain the dignity. G.'s writings, although disfigured by credulity, and in the personal narratives with which they abound, by excessive vanity, are of great value as materials for the history, and for the social condition of the age and the countries which he describes. But they must be read with much caution, and with a careful critical consideration of the sources of the information which they embody. Several of his works are still preserved in manuscript in the British Museum, the Bodleian, the Lambeth, and Corpus Christi College Libraries. His printed works are the *Itinerarium Cambriæ; Topographiæ Hiberniæ; Expugnatio Hiberniæ; Descriptio Cambriæ;* and several smaller pieces, which are printed in the second volume of Wharton's *Anglia Sacra.* Barry's work on Ireland called out several rejoinders, the most valuable of which is that of John Lynch (under the pseudonym of *Gratianus Lucius*), entitled *Cambrensis Eversus;* a less valuable work is that of Stephen White, recently published, from the original manuscripts; Sir James Ware has freely criticised Barry in the *Antiquities of Ireland.*

GIRARDIN, EMILE DE, a French journalist and politician, the illegitimate son of the royalist general Alexandre de Girardin and Madame Dupuy, was born in Switzerland in 1802, educated in Paris, and in 1823 was appointed general secretary of the royal museums. After the July revolution, G. established the *Journal des Connaissances utiles,* for which he secured 120,000 subscribers; in 1832, the *Musée des Familles;* and in 1834, the *Almanach de France.* He also published an *Atlas de France* and an *Atlas Universel.* The whole of these publications were set forth as emanating from a *Société Nationale pour l'émancipation intellectuelle,* and were not without a considerable influence on the progress of public instruction in France. In 1836 he founded the *Presse,* as an organ of political conservatism, and soon found himself entangled in violent controversies. One of the unfortunate results of these was his duel with Armand Carrel, editor of the *National,* in which the latter fell. From this time onward to the Revolution of 1848, he was ardently occupied with politics both as a journalist and deputy; and from being a defender of Guizot and moderate liberalism, he became a decided republican.

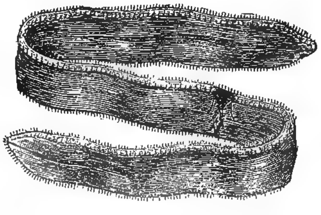
G. was the first to propose Louis Napoleon as a candidate for the Presidentship, but only four weeks after the triumph of the latter, he opposed him with the greatest virulence—the reason generally given, being that the President had shewn himself unwilling to agree to the political scheme submitted to him by his advocate. G. now threw himself into the arms of the Socialists. In 1856, he sold his share of the *Presse,* being unable to submit to the restrictions on journalism. G. is regarded as one of the ablest, though at the same time, one of the most turn-coat journalists in France. He is very fertile and original in his political ideas, which he has given to the world in a host of brochures.—MADAME DE GIRARDIN, wife of the preceding, whose maiden name was Delphine Gay (born 26th January 1804, died 29th June 1855), enjoyed during her lifetime a brilliant reputation, as a poetess, novelist, and play-writer. Her best known work is her *Lettres Parisiennes,* which appeared in her husband's periodical *La Presse,* under the pseudonym of Le Vicomte de Launay.

GIRARDIN, ST MARC, an eminent French journalist and professor, born at Paris in 1801. He studied at the Collége Napoléon and the Collége Henri IV. with brilliant success, and in 1827 obtained a professorship in the Collége Louis-le-Grand. During a visit to Germany in 1830, he formed a close intimacy with Gans and Hegel, and on his return to Paris, was appointed to succeed Guizot as professor of history in the Faculty of Letters, and was named master of requests to the Council of State. In 1834 he was called to the chair of poetry at the Sorbonne. About the same time he was elected a member of the Chamber of Deputies, and acquired a considerable reputation by his report upon the organisation of secondary instruction presented in 1837. In 1844 he was received into the *Académie.* G. took no special part in the Revolution of 1848, and still continues his functions as professor at the Sorbonne. His influence and popularity as a lecturer are very great. Clearness, good sense, moderation, vivacity, and humour are his leading characteristics. Besides his numerous contributions to the *Débats,* which he has partly edited since 1827, and to the *Revue des Deux Mondes,* he has published several large works, among which may be mentioned *Notices Politiques et Littéraires sur l'Allemagne* (1834); *Cours de Littérature Dramatique* (4 vols. 1843); *Essais de Littérature et de Morale* (2 vols. 1844); and *Tableau de la Littérature au 16th Siècle, suivi d'Etudes sur la Littérature du Moyen Age et de la Renaissance* (1862).

GI'RASOL, a precious stone, exhibiting in strong lights a peculiar and beautiful reflection of bright red or yellow light, which seems to come from the interior of the stone. From this it derives its name (Ital. 'sun-turning'). There are different kinds of G., variously referred by mineralogists to quartz and opal, species which, however, are very nearly allied. One kind is also known as *Fire Opal,* which is found only at Zimapan, in Mexico, and in the Faroe Islands. The Mexican specimens are of a rich topaz yellow colour, and the reflection is very bright. Another kind is the *Quartz Resinite* of Haüy, so called because of its characteristic resinous fracture. It is found of various colours, sometimes of a fine yellow or emerald green, more generally bluish white. For a specimen of extraordinary brilliancy, not an inch and a half in diameter, £1000 has been refused. The ancients held this stone in high estimation. They called it *Asteria* (Gr. *aster,* a star). They obtained it both from Caramania and from India. The Caramanian stones were preferred. The brightest are at present brought from Brazil, but fine specimens are also brought from Siberia. Imitation girasols are made of glass, in which a little oxide of tin is mixed.—The name G. is sometimes given to a kind of sapphire, also called *Asteria sapphire,* exhibiting a similar reflection of light, and sometimes to *Sunstone,* an avanturine felspar.

GIRDER, a main beam used to support joisting walls, arches, &c. Girders may be of wood or iron, and are now very commonly made of cast iron. They are much used in supporting the upper walls of houses, while the lower part is cut away to allow of rearrangement. Wooden girders are sometimes strengthened with iron trusses, and are then called trussed girders. Sometimes a beam is cut in two, and an iron plate inserted between the pieces, and the whole bolted together. This kind of girder is called a sandwich beam. Girders are much used in railway works, in which case they are generally of wrought iron. The Menai and Britannia Bridges are simply very large boxed girders. The *lattice* girder is another form in which the sides are made somewhat like wooden lattice-work. See STRENGTH OF MATERIALS.

GIRDLE OF VENUS (*Cestum Veneris*), a very remarkable animal, one of the *Acalephæ* (q. v.), inhabiting the Mediterranean, gelatinous, of a ribbon-like shape, sometimes five or six feet in apparent length by about two inches in breadth; although considered with reference to the structure of the animal, the apparent length is really its breadth, and the apparent breadth its length. The mouth is situated in the middle of the inferior edge, and the stomach is imbedded in the gelatinous substance. The edges are fringed with cilia, by the movements of which the creature seems to be propelled in the water. It exhibits lovely iridescent colours by day, and brilliant phosphorescence by night. Its substance is so delicate, that a perfect specimen can with difficulty be obtained.



Girdle of Venus (*Cestum Veneris*).

GI'RGEH, the third largest town of Egypt, is situated on the left bank of the Nile, in lat. 26° 20′ N., and long. 31° 58′ E. It was here that the discontented Mamelukes rallied against Mohammed Ali. It contains eight handsome mosques, a large bazaar, and a cotton manufactory. The population is about 10,000, of whom 800 are Christians, and it has a convent of Catholic missionaries.—Clot Bey, *Aperçu Gênerale sur l'Egypte*, i. p. 214.

GIRGE'NTI. See AGRIGENTUM.

GIRL, in Heraldry, is the term used to signify the young of the roe in its second year.

GI'RNAR, a sacred mountain in India of most remarkable aspect, stands in the peninsula of Kattywar, which forms part of the native state of Guzerat, in lat. 21° 30′ N., and long. 70° 42′ E. Above the mass of luxuriant hills and valleys which surround its base, rises a bare and black rock of granite to the height of about 3000 feet above the sea. The summit is broken into various peaks, its northern and southern sides being nearly perpendicular. An immense boulder, which seems to be poised on one of the scarped pinnacles, is called the Beiru Jhap, or Leap of Death, from its being used by devotees for the purpose of self-destruction.

GIRONDE, a maritime department in the south-west of France, is formed out of part of the old province of Guienne, and is bounded on the W. by the Bay of Biscay, on the N. by the department of Charente-Inférieure, on the E. by those of Dordogne and Lot-et-Garonne, and on the S. by that of Landes. It has an area of 4132 square miles, and a population of 640,757. It is watered mainly by the Garonne and the Dordogne, and by the Gironde, which is formed by the union of these two rivers. The surface of the land is in general flat; but in the east there are some hills. The climate is temperate, and except in the Landes or sandy tracts, which, however, occupy nearly all the western half of the department, is healthy. In the east and north-east the soil is chiefly calcareous. Wine, including the finest clarets, is the great product of the department. The principal growths are those of Lafitte, Latour, Château-Margaux, Haut-Brion, Sauterne, Barsac, and the Vins de Grave, and the quantity produced annually averages 44,000,000 gallons. Grain, vegetables, fruit, and hemp are also produced largely. On the west coast, on the downs or sand-hills, there are extensive plantations of pine, from which turpentine, pitch, and charcoal are obtained. The shepherds of the Landes traverse the sands on high stilts, and travel with them also to markets and fairs. Among the manufactures, salt, calico, muslin, chemical products, pottery, paper, vinegar, and brandy, are the chief. Bordeaux is the capital.

GIRO'NDISTS (Fr. *Girondins*), the name given during the French Revolution to the moderate republican party. When the Legislative Assembly met in October 1791, the Gironde department chose for its representatives the advocates Vergniaud, Guadet, Gensonné, Grangeneuve, and a young merchant named Ducos, all of whom soon acquired great influence by their rhetorical talents and political principles, which were derived from a rather hazy notion of Grecian republicanism. They were joined by Brissot's party and the adherents of Roland, as well as by several leaders of the Centre, such as Condorcet, Fauchet, Lasource, Isnard, and Henri La Rivière, and for some time had a parliamentary majority. They first directed their efforts against the reactionary policy of the court, and the king saw himself compelled to select the more moderate of the party, Roland, Dumouriez, Clavière, and Servan, to be ministers. Ultimately, however, he dismissed them, a measure which led to the insurrection of the 20th June 1792. The encroachments of the populace, and the rise of the Jacobin leaders, compelled the G. to assume a conservative attitude; but though their eloquence still prevailed in the Assembly, their popularity and power out of doors were wholly gone, and they were quite unable to prevent such hideous crimes as the September massacres. The principal things which they *attempted* to do after this—for they never succeeded in accomplishing anything—were to procure the arrestment of the leaders of the September massacres, Danton, &c.; to overawe the mob of Paris by a guard selected from all the departments of France; to save the king's life by the absurdest of all possible means, viz., by first voting his death, and then by intending to appeal to the nation; and, finally, to impeach Marat, who, in turn, induced the various sections of Paris to demand their expulsion from the assembly and their arrestment. This demand, backed up as it was by 170 pieces of artillery under the disposal of Henriot (q. v.), leader of the sans-culottes, could not be resisted; thirty of the G. were arrested on a motion of Couthon, but the majority had escaped to the provinces. In the departments of Eure, Calvados, and all through Brittany, the people rose in their defence, and under the command of General Wimpfen, formed the so-called 'federalist' army, which was to rescue the republic from the hands of the Parisian populace. Movements for the cause of the G. took place likewise at Lyon, Marseille, and Bordeaux. The progress of the insurrection was, however, stopped by the activity of the Convention. On the 20th July, the revolutionary army took possession of Caen, the chief station of the insurgents, whereupon the deputies of the Convention, at the head of the sans-culottes, forced their way into the other towns, and commenced a fearful retribution.

On the 1st October 1793, the prisoners were accused before the Convention by Amar, as the mouthpiece of the Committee of Public Safety, of conspiring against the republic with Louis XVI., the royalists, the Duke of Orleans, Lafayette, and Pitt, and it was decreed that they should be brought before the Revolutionary Tribunal. On the 24th, their trial commenced. The accusers were such men as Chabot, Hébert, and Fabre d'Eglantine. The G., however, defended themselves so effectually, that the Convention on the 30th was obliged to come forward and decree the closing of the investigation. That very night, Brissot, Vergniaud, Gensonné, Ducos, Fonfrède, Lacaze, Lasource, Valazé, Sillery, Fauchet, Duperret, Carra, Lehardy, Duchâtel, Gardien, Boileau, Beauvais, Vigée, Duprat, Mainvielle, and Antiboul, were sentenced to death, and, with the exception of Valazé, who stabbed himself on hearing his sentence pronounced, all perished by the guillotine. On their way to the Place de Grève, in the true spirit of French republicanism, they sang the *Marseillaise.* Coustard, Manuel, Cussy, Noel, Kersaint, Rabaut St Etienne, Bernard, and Mazuyer, were likewise afterwards guillotined. Biroteau, Grangeneuve, Guadet, Salles, and Barbaroux ascended the scaffold at Bordeaux; Lidon and Chambon, at Brives; Valady, at Périgueux; Dechézeau, at Rochelle. Rebecqui drowned himself at Marseille, Pétion and Buzot stabbed themselves, and Condorcet poisoned himself. Sixteen months later, after the fall of the Terrorists, the outlawed members, including the G. Lanjuinais, Defermon, Pontécoulant, Louvet, Isnard, and La Rivière, again appeared in the Convention. A rather flattering picture of the party has been drawn by Lamartine, in his *Histoire des Girondins* (8 vols., Paris, 1847).

GIRONNÉ, GYRONNÉ, GYRONNY (Latin, *gyrus*, a circle), terms used in Heraldry to indicate that the Field (q. v.) is divided into six, eight, or more triangular portions, of different tinctures, the points of the triangles all meeting in the centre of the shield. Nisbet (i. 28) objects to this as a vulgar mode of blazoning, and, in speaking of the 'paternal ensign of the ancient surname of Campbell,' he says (p. 31) that it is 'composed of the four principal partition lines, parti, coupé, traunché, taillé, which divide the field into eight gironal segments, ordinarily blazoned with us girony of eight, or, and sable.' The triangle in dexter-chief has been called a Giron or Gyron.

GI'RVAN, a seaport town and burgh of barony, on the west coast of Scotland, is beautifully situated at the mouth of the river Girvan, in the county of Ayr, and about 21 miles south-west of the town of that name. It is now the terminus of the Glasgow and South-Western Railway, and owns considerable tonnage in shipping. The harbour has been much improved of late, and a considerable trade, especially in the shipment of coal, is carried on betwixt G. and Belfast, from which it is distant about 65 miles. The valley of the Girvan is one of the most beautiful and best cultivated districts in the south-west of Ayrshire, and abounds with coal, lime, and ironstone. The land is of the richest description. The town is situated opposite the celebrated 'Ailsa Craig,' and has been much frequented of late in the summer season by parties in quest of sea-bathing, for which the coast is admirably adapted. Pop. (1861) 7047.

GISORS, a town of France, in the department of Eure, situated on the river Epte, 33 miles north-east of Evreux, and on the high-road from Paris to Rouen. Pop. 3245. Here a battle took place, 10th October 1198, between the French and English, in which the former were completely defeated. Richard I., who commanded the English, gave, as the 'parole,' or watchword of the day, *Dieu et mon Droit* (God and my Right), and ever since, the expression has been the motto to the royal arms of England.

GIULI'NI, Giorgio, a learned historian and antiquary, was born at Milan in 1714. He studied law at the university of Padua, and received the degree of Doctor at an early age. G. devoted his decided antiquarian genius to researches into the monuments and remains of his native land; and after twenty years of patient labour, he published a valuable historical work, entitled *Memoirs concerning the Government of Milan, with Description of the City and Milanese Territory from the Early Ages.* These Memoirs, in 4 vols., embrace the period from the destruction of the Lombard domination, or establishment of the Franks in Italy, down to the opening of the 14th century. In three subsequent books, he descends to 1447, when the House of Visconti was elevated to sovereign rule in Milan. The work is considered by G.'s countrymen a master-piece of learning, impartiality, and judgment. Much of the history is based upon the evidence of coins, seals, documents, and monuments of the various ages. Milan proudly recognised G.'s patriotic labour by appointing him state historian, and, at the request of the Empress Maria-Theresa, he collected materials for four additional books, with the view of bringing the work down to the 16th century. Before achieving this design, he died of apoplexy on Christmas Eve, in 1780. G. was distinguished for active benevolence as well as learning. He likewise cultivated with enthusiasm both poetry and music.

GIULIO PIPPI, surnamed 'Romano,' from the place of his birth, was born at Rome in 1492, and became one of Raphael's most distinguished and beloved pupils. His excellence as an architect and engineer almost equalled his genius as a painter. G. assisted Raphael in the execution of several of his finest works, and by special desire of the great master, he was intrusted with the completion of all his unfinished designs after his death. He likewise inherited a great portion of Raphael's wealth. The works executed by G., in imitation of Raphael, reflect so wonderfully, not alone the style and character, but the sentiment and spirit of the original, that in many instances uncertainty has arisen as to the hand from which they emanated; while, on the contrary, the more original creations of G. are deficient in the ideal grace of his master, and display rather breadth, and power of treatment, and boldness of imagination, than poetical refinement or elevation. Unlike Raphael, the chief excellence of G. does not lie in his conception of the *divine* or Christian, but rather of the *classical* ideal. G. died in 1546.

The principal architectural works designed by G. were executed at Mantua, during his lengthened residence at the court of Duke Frederick Gonzaga. The drainage of the marshes surrounding Mantua, and the securing the city from the frequent inundations of the rivers Po and Mincio, attest his skill as an engineer; while his genius as an architect found free scope in the restoration and adornment of many of the chief public edifices of Mantua, and especially in the erection of the splendid palace known as Il Palazzo del Te, which he also embellished with mythological frescoes, and a profusion of exquisite decorations. Many of G.'s finest pictures passed into the possession of Charles I. of England, who purchased, in 1629, the celebrated collection of the Dukes of Mantua. Several of them are now contained in the Hampton Court Gallery; but the finest of all, a 'Nativity,' was sold to France, and now adorns the Louvre. The Naples gallery of Capi d'Opera possesses a Holy Family by G., called the 'Madonna della Gatta,' and considered the greatest of his pictures; it is strongly imbued with the spirit and influence of Raphael. The Loggia of Raphael, in the Vatican, also contains some fine frescoes executed by G.; and in the Palazzo Farnese there is a grand frieze attributed to him.

GIURGE'VO, an important trading town of Wallachia, is situated on the left bank of the Danube, directly opposite Rustchuk, and 40 miles south-south-west from Bucharest, of which town it is the port. It was originally the Genoese settlement of St George. It is the great landing-place for steamers in Wallachia. A bridge across a narrow channel connects G. with Slobodse, an island in the Danube, on which stands a fortified castle. Here the Turks defeated the Russians, 7th July 1854. Pop. 20,000.

GIU'STI, Giuseppe, the most celebrated and popular of the modern poets and satirists of Italy, was born in 1809, at Pescia, in the vicinity of Florence. Sprung from an influential Tuscan family, G. was early destined to the bar, and at Pistoja and Lucca commenced the preliminary studies, which were completed at the university of Pisa, where he obtained his degree of Doctor of Laws. Sustained earnestness of study seems to have formed no feature in G.'s collegiate course, whose natural bent rather inclined him to a genial participation in the freaks and social pleasures of his companions than to the erudite investigation of the Pandects. On quitting Pisa, G. was domiciled at Florence with the eminent advocate Capoquadri, who subsequently became Minister of Justice, and here he first attempted poetry. Lyrical compositions of the romantic school, evincing both elevated and nervous thought, were his earliest efforts; but he speedily comprehended that satire, not idealism, was his true forte. In a pre-eminent degree, G. possesses the requirements of a great lyrical satirist—terse, clear, and brilliant, he depicts, alternately with the poignant regret of the humanitarian, and the mocking laugh of the ironist, the decorous shams and conventional vices of his age. His impartiality only lends a keener sting to his denunciation. The stern flagellator of tyrants, he is no less merciless in stigmatising those whose pliant servility helps to perpetuate the abasement of their country. Nor does he adulate the people, whose champion he avowedly is, and whose follies and inconsistencies he indicates with the faithfulness of a watchful friend. The writings of G. exercised a positive political influence. When the functions of the press were ignored, and freedom of thought was treason, his flaming verses in manuscript were throughout all Italy in general circulation, fanning the hatred of foreign despots, and powerfully assisted in preparing the revolutionary insurrection of 1848. Then, for the first time, did G. discard the pseudonym of 'The Anonymous Tuscan,' and append his name to a volume of verses bearing on the events and aims of the times. All his compositions are short pieces, rarely blemished with personalities, and written in the purest form of the popular Tuscan dialect. The elegant familiarity of idiom which constitutes one of their chief and original beauties in the eyes of their native readers, presents great difficulties to foreigners, and still greater to the translator. G.'s writings are not only Italian in spirit and wit, but essentially Tuscan. A reverent student of Dante, G. himself often reaches an almost Dantesque sublimity in the higher outbursts of his scornful wrath, while he stands alone in the lighter play of ironical wit. In politics, an enlightened and moderate liberal, averse alike to bureaucracy and mobocracy, G. was also beloved in private life for his social qualities, and his loving and gentle spirit. He died in 1850, aged 41, in the dwelling of his attached friend, the Marquis Gino Capponi, at Florence; and the throng of citizens who followed him to the grave, in the teeth of Austrian prohibition, attested eloquently the repute he enjoyed in life. His most celebrated pieces are entitled *Stivale*, or the History of a Boot (Italy), a humorous narration of all the misfits, ill-usage, and patching allotted to this unfortunate down-trodden symbol of his country; *Gingillino*, a master-piece of sarcasm, portraying the ignoble career of the sycophant, whose supple back and petty diplomacy finally secure for him the highest distinctions; *Il Re Travicello*, or King Log, the subject of which is indicated by the title; *Il Brindisi di Girella*, or the Weathercock's Toast, one of his best pieces, dedicated to the suggestive name of Talleyrand; and the *Dies Iræ*, or Funeral Oration of the Emperor Francis I. The only authorised and correct edition of his works is that published at Florence in 1852 by Le Monnier.

GIUSTINIA'NI, an illustrious Italian race, to which the republics of Venice and Genoa owed more than one doge. One of the palatial residences of Rome was erected towards the end of the 16th c. by a descendant of the family, the Marquis Giustiniani. The site he selected for the palace was a portion of the ruins of Nero's baths, and on its completion he enriched it with a magnificent private gallery of paintings, and a fine collection of sculptures. He also formed a museum of antiquities, the treasures of which were discovered on the spot. In 1807, the G. family conveyed the collection of paintings to Paris, where they disposed of the greater part by auction, and privately sold the remainder, consisting of 170 fine paintings, to the artist Bonnechose, who, in his turn, resold them to the king of Prussia. This fragment of the famous Giustiniani Gallery now enriches the Berlin Museum, and a very few of its former treasures are still to be found in the Giustiniani palace at Rome.

GIVET, a town of France, and a fortress of the first rank, is situated in the department of Ardennes, on both banks of the Meuse, close to the border of Belgium, and 145 miles north-east of Paris. The town consists of three districts—Charlemont, Givet St Hilaire, and Givet Notre Dame, all lying within the line of the fortifications. It is well situated in a commercial point of view, is regularly built, has handsome squares, a good port, barracks, a military hospital, and manufactures of leather, for which G. is famous, of white-lead, clay-pipes, sealing-wax, and nails; breweries, marble-works, and a zinc and copper foundry are also carried on. Pop. 4136.

GIVORS, a town of France, in the department of Rhone, is situated on the right bank of the river of that name, 14 miles south of Lyon. Bottles and window glass are here extensively manufactured, and a trade in ironstone and coal is carried on. Pop. 8578.

GLA'CIER is a name given to immense masses of ice, which are formed above the snow-line, on lofty mountains, and descend into the valleys to a greater or less distance, often encroaching on the cultivated regions. The materials of the glaciers are derived from the snow which falls during summer as well as winter on the summits of high mountains. Every fresh fall of snow adds a little to the height of the mountain, and, were there no agents at work to get rid of it, the mountains would be gradually rising to an indefinite elevation. Avalanches and glaciers, however, carry the snow into warmer regions, where it is reduced to water; in the one, the snow slips from the steep mountain slopes, and rushes rapidly down; in the other, it gradually descends, and is converted into ice in its progress. The snow which forms the glacier at its origin has a very different appearance and consistence from the ice of which it consists at its lower termination. The minute state of division of the ice, in its snow condition, and the quantity of air interspersed through it, gives it its characteristic white colour. Two causes operate in causing this change into ice: first, pressure expels the air, by bringing the particles of the lower layers of snow more closely together; and second, the summer's heat melting the surface, the water thus obtained percolates through the mass beneath, and as it passes amongst the particles whose temperature is below 32° F., it increases their size by external additions till the particles meet, and the whole becomes a solid mass. The snowy region of the glacier is called by the French name *névé*. In large glaciers, the névé is of great extent, a large quantity of material being required to make up the waste. The névé is, however, often confined to narrow valleys, and, as a consequence, produces glaciers which soon perish. The increase of a glacier by snow falling on its surface takes place only above the snow-line—below that line, all the accumulated winter's snows are speedily melted by the summer's heat. The ice of the glacier seldom exhibits any traces of the horizontal stratification which is found in the névé, but is generally intersected with vertical veins of clear blue ice.

Glacier on the Alps.

The most remarkable feature of glaciers is their motion. It has been long known to the natives of the Alps that they move, but it is only within the last few years that it has received due attention from scientific men; the account of their observations, and the theories based upon them, form one of the most interesting chapters in the history of glaciers. See the writings of Agassiz, Forbes, and Tyndall. The continual waste of glaciers below the snow-line, both along its surface and at its extremity, is ever being repaired, so that the glacier does not recede from the valley, nor decrease in depth. That the materials of the reparation are not derived from the fall of the winter's snow, and the influence of the winter's frost, is evident, inasmuch as these additions speedily disappear with the return of the summer's heat, and in the end form but a small proportion of the year's total loss. The true repairing agent is the motion of the glacier, which brings down the glacified snow from the upper regions to be melted below. To account for this motion, Charpantier supposed the water which saturated the glacier in all its parts, and filled the innumerable capillary fissures, was, during night and during the winter, frozen, and that the well-known and almost irresistible expansion which would take place in the conversion of the water into ice, furnished the force necessary to move the glacier forwards. This theory, known as the *dilatation theory*, was for some time adopted by Agassiz, but ultimately abandoned. Agassiz shewed that the interior of the glacier had a temperature of 32° F., and subsequent observations have shewn that the glacier moves more rapidly in summer than in winter. In 1799, De Saussure published a second theory, known as the *gravitation* or *sliding theory*, in which he supposed that the glacier moved by sliding down the inclined plane on which it rested, and that it was kept from adhering to its bed, and sometimes even elevated by the water melted in the contact of the glacier with the naturally warmer earth. While correctly attributing the motion to gravity, De Saussure erred in considering glaciers as continuous and more or less rigid solids—indeed, the motion he attributes to them would, if commenced, be accelerated by gravity, and dash the glacier from its bed as an avalanche. Principal Forbes was the author of the next important theory. Considerable attention had in the meantime been paid to the subject by Rendu, Agassiz, and others. Rendu had shewn that the glacier possessed a semi-fluid or river-like motion, in explaining the difference between observations made by him at the centre, which 'moves more rapidly,' and others made at the sides, 'where the ice is retained by the friction against its rocky walls.' The results based on Rendu's observations were established by the repeated and exact measurements of Forbes, who, in the progress of his examinations, made the further discoveries, that the surface moves more rapidly than the ice near the bottom, and the middle than the sides; that the rate of motion is greater where the glacier-bed has the greatest inclination; and that the motion is continued in winter, while it is accelerated in summer by the increase of the temperature of the air. The only theory which, as it appeared to Forbes, could account for these phenomena is thus expressed by him: 'A glacier is an imperfect fluid or a viscous body, which is urged down slopes of a certain inclination by the mutual pressure of its parts.' This is known as the *viscous theory*. He considered a glacier as not a crystalline solid, like ice tranquilly frozen in a mould, but that it possessed a peculiar fissured and laminated structure, through which water entered into its intrinsic composition, giving it a viscid consistence, similar to that possessed by treacle, honey, or tar, but differing in degree. Professor Tyndall has published another theory, which he designates the *pressure theory*. This differs little from that of Forbes, except that it denies that glacier ice is in the least viscid. By a number of independent observations, he established the facts first noticed by Rendu and Forbes, and added the important one, that the place of greatest motion is not in the centre of the glacier, but in a curve more deeply sinuous than the valley itself, crossing the axis of the glacier at each point of contrary flexure—in fact, that its motion is similar to that of a river whose point of maximum motion is not central, but deviates towards that side of the valley towards which the river turns its convex boundary. This seems a further corroboration of the viscous theory, but Tyndall explained it and the other facts by a theory which, while maintaining the *quasi*-fluid motion of the glacier, denied that this motion was owing to its being in a viscous condition. The germ of his theory, as he tells us, was derived from some observations and experiments of Faraday's in 1850, who shewed, 'that when two pieces of ice, with moistened surfaces, were placed in contact, they became cemented together by the freezing of the film of water between them, while, when the ice was below 32° F., and therefore *dry*, no effect of this kind could be produced. The freezing was also found to take place under water.' By a further series of experiments, Tyndall found that ice at 32° F. could be compressed into any form, and that no matter how great the bruising of its particles and the change of its shape, it would, from this property of regelation, re-establish its continuous solid condition, if the particles of ice operated on were kept in close contact. These facts he applied to the motion of glaciers, asserting that the pressure of the parts of a glacier on each other, in a downward direction, produced by gravitation, was more powerful than the attraction which held the particles of the ice together—that, consequently, the ice was ruptured, to permit the motion of the glacier, the particles being, however, speedily reunited by regelation. The supposed viscous condition of ice he believed to be refuted by the fact that, whenever the glacier is subjected to tension, as in passing over a cascade, it does not yield by stretching, but always by breaking, so as to form crevasses. This theory, equally with that of Forbes, explains the known phenomena of glaciers, while the advantage is claimed for it of not drawing upon our imagination as to a required condition of the ice, but, by experiment, exhibiting ice from known causes producing effects on the small scale similar to those produced in nature on the large. Forbes, however, maintains (*Occasional Papers*, &c., 1859) that all that is peculiar to Tyndall's theory was included in his own; and that the facts discovered and expounded by Faraday in 1850 had already been used by him as part of his theory in 1846. He says that his viscous theory included the notion 'of an infinity of minute rents; that it also embraces the substitution of the finite sliding of the internally bruised surfaces over one another;' and that it includes 'the reconsolidation of the bruised glacial substance into a coherent whole by pressure acting upon ice, softened by imminent thaw.'

Professor Tyndall re-introduces and re-asserts the gravitation theory of De Saussure as in part the cause of the glacier's motion; but the phenomena which he considers produced by a sliding motion of the whole mass over its bed—viz., the polishing and grooving of the rock below—can be produced by a substance whose motion is the result of a yielding of its parts, if that substance has sufficient consistence to retain firmly imbedded in its lower surface portions of rock to act as polishers, and it cannot be doubted that the ice of glaciers has such a consistency.

Some of the more remarkable phenomena of glaciers remain to be noticed. The surface of the glacier does not long retain the purity of the snow from which it is derived, but is speedily loaded with long ridges of débris called *moraines*. The mountains which rise on either side of the valley occupied by the glacier are continually suffering loss from the action of the rain, disruption by frost, and the impulse of avalanches. The materials thus liberated find their way to the glacier, and form a line of rock and rubbish on its two borders, of greater or less size, dependent on the friability or compactness of the adjacent mountains. The *lateral moraines* often reach to a great height, as much as forty or fifty feet above the level of the glacier. The whole ridge appears to consist of débris, but it is really a ridge of ice with a covering of foreign materials, which, by protecting the underlying ice from the heat which they radiate and only partially transmit, leave the moraine as a more and more elevated ridge, while the surface of the glacier is speedily melting. *Glacier tables* have a similar origin. A large and isolated mass of rock, resting on the glacier, protects the ice below; and as the glacier melts, it leaves the rock poised on the summit of an icy column. As the rays of the sun play on the table all day obliquely, the column is gradually melted from under the rock, until it slips off, and begins to form another table; while the unprotected column speedily melts and disappears. Where two glaciers unite, the trails of rock on the inner margins unite also, and form a single ridge, which runs along the middle of the large trunk glacier, and is called a *medial moraine*. It is evident that the number of the medial moraines must thus depend upon the number of the branch glaciers, and must indeed be invariably one less. The glacier terminates amidst a mass of stones and débris, which having been carried down on its surface, are finally deposited by its melting at its extremity, forming there a *terminal moraine*. Sometimes a glacier decreases in size, either withdrawing from the valley, and leaving the terminal moraine as a barren waste of rocks, or melting on its superficies throughout its length, and depositing its lateral moraines as a ridge of débris on either side at some height above it on the mountain. The existence of such collections of rocks is plain evidence of the former position and altitude of glaciers, and even of their former occurrence in countries where they are now unknown.

It has been stated, that when the glacier is subjected to tension, the continuity of its parts is destroyed, and fissures, called *crevasses*, are formed. In passing over a brow on the channel, the ice invariably yields; at first, a deep crack is formed, which gradually widens until a fissure or chasm is produced across the glacier. Transverse crevasses disappear when the glacier reaches a level portion of its bed; the pressure bringing the walls again together, the chasm is closed up. Longitudinal crevasses are produced when the glacier escapes from a confined channel, and spreads itself over a wider area. The spreading of the margins causes a tension in the body of the glacier, which yields, and longitudinal fissures are formed. These occasionally rend the terminal front of a glacier. The smaller marginal crevasses are formed from the tension of the ice, produced by the normal motion of the glacier being retarded by the friction against the sides of its channel. The motion of the glacier is gradually accelerated from the margin inwards, consequently the lines of greatest tension are inclined downwards and towards the centre, more or less, in proportion to the rapidity of the motion. The crevasses formed by the yielding of the ice are at right angles to the lines of tension, and consequently point up the glacier.

The *veined structure* is apparently the result of pressure. The veins consist of blue ice penetrating the white mass of the glacier, and occur either in irregular directions, or producing a regularly laminated structure. The blue veins are portions of ice from which the air-bubbles have been expelled, and which are consequently more compact than the general substance of the glacier. The pressure is exerted in three directions, producing veins which are complementary to the three kinds of crevasses which have just been noticed. When the glacier passes over a level, or perhaps a gently rising channel, transverse veins are formed; when it is pressed through a narrower channel, longitudinal veins are produced; and the pressure at the margins produced by the retardation of the flow by friction causes the formation of marginal veins in the lines of greatest pressure, that is, at right angles to the marginal crevasses.

The melting of the ice on the surface of the glacier produces streams, whose course is often broken by crevasses, down which the water descends, finding egress at last through the cavernous mouth at the termination of the glacier, where it issues after being increased by other streams, which have by similar channels reached the bottom, as well as by the melting of the ice from the contact of the earth. The rushing water wears a shaft of greater diameter than the crevasse, and this shaft often remains after the margins of the crevasse have been reunited. In the progress of the glacier, another crevasse intersects the bed of the stream, and down this the water is diverted, leaving the formed shaft or *moulin*, as it is called. The forsaken moulin has at its base a quantity of earth and stones collected by the stream from the surface of the glacier; these are gradually raised to the surface by the melting of the glacier, and eventually appear as cones of débris, sometimes rising high on columns of ice under the same influences as the glacier tables.

Glaciers are not necessarily peculiar to any country or zone, but wherever there are mountains of sufficient height, it may be expected that they may exist. In Europe, they are chiefly confined to the Alps and Norway. Having their origin in the region of perpetual snow, they reach far down into the valleys, the largest pushing themselves furthest down. That of Bossous at Chamouni, which comes from the highest part of Mont Blanc, reaches a point 5500 feet below the snow-line, where it is embosomed amongst luxuriant wood, and is almost in contact with cornfields. Hooker and others have described the glaciers of the Himalaya. Iceland and Spitzbergen also abound in glaciers. It is in such northern localities that the ends of the glaciers, resting on the waters of the ocean, get broken off by transverse crevasses, and float away as icebergs.

It has already been noticed that the former existence of glaciers is indicated by the occurrence of moraines. These have been noticed in various localities in Wales, England, and Scotland. They are referred to the period when the Boulder-Clay (q. v.) was deposited; and this, with the sands and gravels which are associated with it, are sometimes included under the title Glacial Deposits.

GLA'CIS (allied to glade in the sense of a lawn), in Fortification (q. v.), the slope of earth, usually turfed, which inclines from the covered-way towards the country. Its object is to bring assailants, as they approach, into a conspicuous line of fire from the parapet of the fortress, and also to mask the general works of the place.

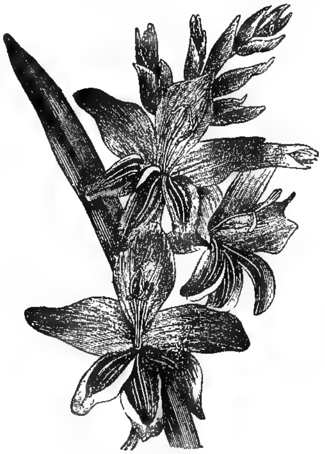
GLA'DIATOR, in Antiquity, from *gladius*, a sword, was one who fought in the arena, at the amphitheatre at Rome, and in other cities, for the amusement of the public. The gladiators were generally slaves, bought and trained for the purpose, by masters who made this their business. The custom is supposed to have been borrowed from the East, and to have had its origin in the practice of human sacrifices, or that of taking the lives of captives or prisoners of war, in honour of heroes who had died in battle. Thus, in the *Iliad*, we read that Achilles sacrificed twelve Trojan prisoners to the manes of his friend Patroclus, and Virgil speaks of captives sent to Evander, to be sacrificed at the funeral of his son Pallas. The 'great custom' of the king of Dahomey thus finds warrant in classic antiquity; and the North American Indians, in putting their prisoners to death with tortures, have only refined upon an ancient barbarism.

After a time, all considerable funerals were solemnised by human sacrifices, which took the form of combats, in which, to increase the interest of the spectators, the prisoners were required to sacrifice each other; and as prisoners, and afterwards other slaves, were kept for this purpose, they were trained to fight with skill and courage, to make the spectacle more impressive. These contests first took place at funerals, but afterwards in the amphitheatre; and in process of time, instead of a funeral rite, became a common amusement. The first we read of in Roman history was the show of a contest of three pairs of gladiators, given by Marcus and Decius Brutus, on the death of their father, in the year of Rome 490. In the year 537, a show of twenty-two pairs was given in the Forum. In 547, the first Africanus diverted his army at New Carthage with a gladiatorial exhibition. The fashion now rapidly increased. Magistrates, public officers, candidates for the popular suffrages, gave shows to the people, which consisted chiefly of these bloody and generally mortal encounters. The emperors exceeded all others in the extent and magnificence of these cruel spectacles. Julius Cæsar gave a show of 320 couples; Titus gave a show of gladiators, wild-beasts, and sea-fights, for 100 days; Trajan gave a show of 123 days, in which 2000 men fought with and killed each other, or fought with wild-beasts for the amusement of the 70,000 Romans, patricians and plebeians, the highest ladies and the lowest rabble, assembled in the Colosseum. A vast number of slaves from all parts of the world were kept in Rome, and trained for these exhibitions. There were so many at the time of Catiline's conspiracy, that they were thought dangerous to the public safety, and it was proposed to distribute them among the distant garrisons.

Efforts were made to limit the number of gladiators, and diminish the frequency of these shows. Cicero proposed a law, that no man should give one for two years before becoming a candidate for office. The Emperor Augustus forbade more than two shows in a year, or that one should be given by a man worth less than half a million sesterces; but it was difficult to restrain what had become a passion, and men even had such contests for the amusement of their guests at ordinary feasts.

These shows were announced by show-bills and pictures, like the plays of our theatres. The gladiators were trained and sworn to fight to the death. If they shewed cowardice, they were killed with tortures. They fought at first with wooden swords, and then with steel. When one of the combatants was disarmed, or upon the ground, the victor looked to the emperor, if present, or to the people, for the signal of death; if they raised their thumbs, his life was spared; if they turned them down, he executed the fatal mandate. A gladiator who had conquered was rewarded with a branch of palm, and sometimes with his freedom. Though the gladiators at first were slaves, freemen afterwards entered the profession, and even knights. Senators and knights fought in the shows of Nero, and women in those of Domitian. The Emperor Constantine prohibited the contests of gladiators, 325 A.D.; but they could not at once be abolished. In the reign of Honorius, Telemachus went into the arena to stop the fight, when the people stoned him. They were finally abolished by Theodoric, 500 A.D.

GLADI'OLUS, a genus of plants of the natural order *Irideæ*, with a tubular perianth, the limb of which is divided into six unequal segments, thread-like, undivided stigmas, and winged seeds. The roots are bulbous; the leaves linear or sword-shaped, whence the name (Lat. a little sword). The Cape of Good Hope produces the greater number of the known species, as well as of several allied genera once included in this. A few, however, are natives of other countries, and two or three are found in Europe. None are British. Most of the species have flowers of great beauty; and some of them are among the finest ornaments of our flower-borders and green-houses. They are propagated either by seed or by offset bulbs; and in the former way many fine new varieties have been produced. Extraordinary medicinal virtues were formerly ascribed to the bulb of *G. communis*, one of the European species, found as far north as Frankfort-on-the-Oder. The Hottentots eat the bulbs of some of the species, which contain a considerable quantity of starch.



Gladiolus Ramosus.

GLADSTONE, The Right Hon. William Ewart, statesman and orator, the third son of Sir John Gladstone, Bart., of Fasque, in Kincardineshire, was born, 1809, at Liverpool, where his father, originally of Leith, had won eminence and wealth as a West India merchant. Mr Canning was a frequent guest at his father's house when he visited his Liverpool constituents, and from the conversation of the great statesman, G. received impressions which gave a colour to his subsequent aims. He was sent to Eton, where he distinguished himself as a student, and afterwards entered himself of Christ Church, Oxford, where he closed a brilliant college career by taking a double first-class degree in 1831. He entered the House of Commons in 1832 for the Duke of Newcastle's borough of Newark. He held the post of Lord of the Treasury, and afterwards that of Under-Secretary of State for the Colonies in the Peel government, for a few months in 1834—1835. In 1838, he published his first work, *The State in its Relations with the Church*, which gave occasion to Mr Macaulay to describe him, in a celebrated review of his work, as a 'young man of unblemished character, the rising hope of those stern and unbending Tories' who followed Sir Robert Peel, while they abhorred his cautious temper and moderate opinions. In 1841, G. became Vice-President of the Board of Trade in the Peel administration, and in 1843, President of the Board. Next to his chief, he took the most prominent part in the revision of the tariff and reduction of import duties, which reached their natural development in the repeal of the Corn Laws. He resigned office in February 1845, when Sir R. Peel proposed to increase the endowments of the College of Maynooth, a proposal at variance with all the principles laid down by G. in his work. He rejoined the ministry in December 1845, succeeding the Earl of Derby (who refused to be a party to the repeal of the Corn Laws) as Colonial Secretary. He rendered Sir R. Peel eloquent and effective aid in carrying the great measure of free trade through the House of Commons, but paid the penalty in the loss both of his office and his seat, for the then Duke of Newcastle, claiming to 'do what he liked with his own,' refused to sanction his re-election for Newark. In 1847, he was elected M.P. for the university of Oxford, which he has ever since continued to represent. During a visit to Naples in 1850, he was induced by curiosity to attend the trial of M. Poerio, who was sentenced to several years' imprisonment, and subjected to indignities and cruelties which roused the generous indignation of the English statesman. The dungeons of the kingdom of the Two Sicilies at this period swarmed with political prisoners, and G., in a letter to the Earl of Aberdeen, made all Europe ring with the story of their sufferings and their wrongs. He has since advocated the cause of Italian independence in many eloquent speeches. In 1851, he opposed the Ecclesiastical Titles Bill, brought in by Lord J. Russell, thinking that no legislation was necessary, and that the act savoured of religious persecution. After refusing an offer to hold office under Lord Derby, he became Chancellor of the Exchequer in the coalition government formed by the Earl of Aberdeen in 1852. When that government fell before a motion in the House of Commons for inquiring into the state of the army before Sebastopol, G. continued for a brief period a member of the cabinet of Lord Palmerston, but soon retired, from an unwillingness to consent to the appointment of the Sebastopol committee. G. then went into opposition, and in 1857 made an eloquent and damaging speech on Mr Cobden's motion condemnatory of Sir John Bowring's proceedings in China, which brought about the defeat of Lord Palmerston, and the dissolution of parliament. In 1858, G. again refused to take office under Lord Derby, but consented to visit the Ionian Islands as Lord High Commissioner Extraordinary. In the second Palmerston administration, he resumed the post of Chancellor of the Exchequer. In 1860, he carried through parliament the commercial treaty with France, which has largely increased the trade between the two countries. His financial scheme, involving the repeal of duties on many articles of general consumption, the simplification of the tariff, an increase in the income tax, and the abolition of the paper duty, was strongly but unsuccessfully opposed in the House of Commons. In the Upper House, the paper duty repeal bill was thrown out on financial grounds. G. boldly denounced this interference with the taxing privileges of the Commons as 'the most gigantic and the most dangerous innovation that has been attempted in our times.' In 1861, he incorporated the repeal of the paper duty in the financial scheme of the year, and had the satisfaction of witnessing the removal of the last obstacle to the dissemination of knowledge. As an orator, G. has no superior among his contemporaries, while as a master of debate he stands unrivalled. His copiousness and wealth of diction are wonderful. He possesses a voice of great power and compass, an earnest and persuasive intonation, a perfect elocution, and easy and expressive gestures. Best of all, his eloquence is animated by principle and conscience, as well as high intellect. G.'s political opinions are probably not yet fully developed, but it may be hoped that a magnificent career of public usefulness still lies before him. In 1858, he published a work on *Homer and the Homeric Age*, the leading idea of which is the strictly historical aim and character of the Homeric poems. He assumes the personality of Homer, and the unity of authorship in the two great poems, and he reads in Homer the history, politics, ethics, and theology of the Homeric age. G. was elected Rector of the university of Edinburgh in 1859. He is still (1862) Chancellor of the Exchequer in the administration of Lord Palmerston.

GLAGOL, GLAGOLITZA, GLAGOLITES, an ancient Slavonic alphabet, principally used in several Roman Catholic dioceses of Istria and Dalmatia, in the psalms, liturgies, and offices of the church. Among these Illyrian adherents to the communion of Rome, mass is not celebrated in Latin, but in an ancient Slavonic dialect, written in this peculiar alphabet, the invention of which is popularly attributed to St Jerome. The use of this liturgy was confirmed to the priesthood by a bull of Pope Innocent IV., 1248. Of the antiquity of this alphabet, the savants have maintained a great variety of opinions. Dobrowsky laid the foundation of a critical investigation of the subject, and has been followed by Kopitar, Jacob Grimm, Ivan Preis, &c. A Glagolitic MS. of the 11th c., belonging to Count Kloz, published under the title of *Glagolita Clozianus* (Vienna, 1836), proves a higher antiquity than some had been willing to allow. Grimm supposes the Glagol alphabet very ancient, from its Runic character; but Preis thinks it more modern than the Kyrillick. The name Glagol is supposed by Kopitar to have been taken from the word *glogolati*, which frequently occurs in the liturgies, and which, though unknown to the Servo-Croatians, signifies in the ecclesiastical idiom, *to speak.* Glagol means *word* or *speech.*

GLAMO'RGANSHIRE, the most southerly of the counties of Wales, is bounded on the S. and S.-W. by the Bristol Channel, on the W. by the county of Caermarthen, on the N. by Brecknock, and on the E. by Monmouth. Area, 547,494 acres; pop. (1851) 231,849; (1861) 317,751. The coast-line, following the principal windings, is about 90 miles in length, and its irregularities occur chiefly in the western portion of the county, and are formed by Swansea Bay and the peninsula of Gower (q. v.). The whole of the northern district is covered with mountains, the highest of which, however, Llangeinor, is only 1859 feet in height. This district comprises the richest coal-bed in the kingdom. The southern portion of the county, called the 'Vale of Glamorgan,' forms a great level, and is by far the most fertile part of South Wales. Its soil is a reddish clay, resting on limestone, and is excellently adapted for the growth of wheat, which is here raised in rich and heavy crops. The mountainous district is intersected by numerous and deep valleys, affording good pasturage for sheep and cattle, and is the source of many of the streams of the county. The chief rivers are the Rumney, the Taff, the Neath, and the Tawe; all of them running southward from the mountains into the Bristol Channel. Besides coal, anthracite or stone-coal and coking-coal, with iron-stone and lead, are found in greater or less quantity. The ironworks at Merthyr-Tydvil are probably the most extensive in the world; and there are many others of scarcely less importance throughout the county. At Neath and Swansea are large copper smelting-works, to which ore is brought from South America, and even from Australia. Lead and tin ores are also brought from considerable distances to this county to be smelted. Wheat, barley, oats, and potatoes are the chief crops raised; and butter and cheese are largely produced and exported. The county of G. returns two members to the House of Commons.

Originally included in the territory of the Silures, and afterwards (under the Romans) in that of Britannia Secunda, and possessing some interesting Roman remains, the district of G., about the close of the 11th c., fell into the hands of the Anglo-Norman barons, and subsequently became, through marriage, a possession of the Duke of Gloucester, afterwards Richard III. The county contains many memorials of the middle ages, in its ruined castles and religious houses. Of these, Oystermouth Castle, a bold and noble ruin overlooking Swansea Bay, Caerphilly Castle, and Margam Abbey, may be taken as perhaps the finest remaining specimens.

GLANCE (Ger. *Glanz*), a term often applied in popular language, and also by mineralogists, to a numerous order or family of minerals, of which *Galena* (q. v.) or *Lead-G.* may be regarded as a type. All of them are metallic, and many of them are known by names indicating the metal which is their principal constituent, as *Lead-G.*, *Silver-G.*, *Bismuth-G.*, &c. In these and many other species, the metal is combined with sulphur, so that the mineral is a sulphuret, but there are also numerous species of G. in which sulphur is not present, but selenium, arsenic, or tellurium takes its place. In some kinds also, two or more metals are present instead of one, in combination with one or other of these non-metallic or semi-metallic substances. Thus, *Gold-G.*, or *Silvanite*, consists of gold and silver in combination with tellurium: it occurs in veins in porphyry, in Transylvania, and is wrought for the sake of both the precious metals which it contains. Several kinds of G. are very valuable ores, as *Lead-G.* or *Galena*, *Copper-G.* or *Redruthite*, and *Silver-G.* or *Argentite.* Although mineralogists have adopted the names *Pyrites*, *Glance*, and *Blende* as names of orders or families, the limits and distinctions of these groups are not well marked. All kinds of G. are fused without much difficulty by the blowpipe. They are also soluble in acids.

GLANCE-COAL. See ANTHRACITE and COAL.

GLA'NDERS is a malignant disease of the equine species, characterised by the appearance within the nostrils of little holes or ulcers, remarkable for their rugged, inflamed, undermined edges, their discharge of sticky, greenish, unhealthy pus, their tendency to spread, and their resistance of treatment. The blood of glanderous subjects is deficient in red globules, contains an excess of albumen and fibrine, and in this vitiated and deteriorated state is inadequate properly to nourish the body, which consequently becomes weak and wasted. The mucous membranes are also irritable and badly nourished; there is consequently impaired respiration, an obstinate choking cough, and relaxed bowels. The lymphatic glands and vessels become inflamed, and in their swollen state may be distinctly felt about the throat and underneath the jaws, and also in the limbs, where they frequently run on to ulceration, constituting Farcy (q. v.). Glanders is produced by any cause which interferes with the purity or integrity of the horse's blood, or produces a deteriorated or depraved state of his system. It has been frequently developed in healthy animals by their breathing for a short time a close, impure atmosphere, and cases of this sort were thus produced amongst the horses of several of our cavalry regiments, whilst being transported in badly constructed, overcrowded vessels to the Crimea in 1854. Confined, overcrowded, badly ventilated stables are almost equally injurious, for they prevent the perfect aëration of the blood, and the prompt removal of its organic impurities. Bad feeding, hard work, and such reducing diseases as diabetes and influenza, also rank amongst the causes of glanders. A small portion of the nasal discharge from a glandered horse coming in contact with the abraded skin of man, communicates the loathsome and fatal disease from which so many attendants of horses have died, and government by the act Vict. 16 and 17, of date 14th August 1853, very properly compels the immediate destruction of every glandered horse. Whilst oxen and dogs are exempt from it, donkeys suffer generally in the acute form, often dying in eight or ten days. Horses frequently have it in a chronic form, and if well fed and managed, sometimes live and work for years. In the old coaching-days, some stages were known to be worked by a glandered team, but no animal with glanderous ulcers or discharge should on any account be preserved, for, besides being perfectly incurable, the fatal disease is communicable not only to healthy horses, but also to human beings.

GLANDS are divided by anatomists into two great classes, viz., true secreting glands and ductless glands.

The first class constitute special organs which are destined for the production of the chief secretions; as, for example, the lachrymal, mammary, and salivary glands, the liver, pancreas, kidneys, &c.; while the suprarenal capsules, the spleen, the thymus, and the thyroid belong to the second class.

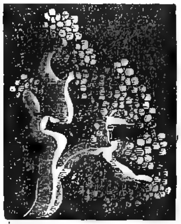


Fig. 1.—Lobule of Parotid Gland of an Infant:
Filled with mercury, and magnified 50 diameters.

An ordinary secreting gland consists of an aggregation of follicles, all of which open into a common duct, by which the glandular product is discharged. The follicles contain in their interior Cells (q. v.), which are the active agents in the secreting process; while their exterior is surrounded by a net-work of capillaries, from whose contents the materials of secretion are extracted.

The simplest form of a gland is the inversion of the surface of a secreting membrane into follicles, which discharge their contents upon it by separate mouths. Of this we have examples in the gastric glands and follicles of Lieberkühn described and figured in the article DIGESTION. Dr Carpenter very well exhibits the commencement of the progressive complication which is observed in most of the glandular structures occurring in man and the higher animals in the accompanying diagram (fig. 2), where A represents a portion of the proventriculus of a falcon, in which follicles formed by simple inversion occur, while B represents a gastric gland from the middle of the human stomach, and C a still more complicated form, produced by the follicles doubling upon themselves, taken from near the pylorus.

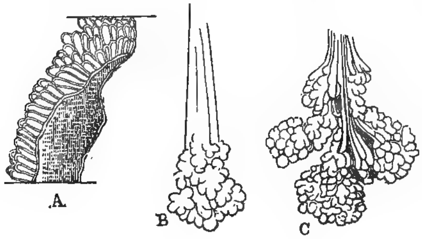


Fig. 2.

The articulata (for example, insects) present glandular structures which can be unravelled much easier than the glands of vertebrate animals; and the forms, in all of which a large amount of secreting surface is presented in comparatively little space, are often very graceful. In the accompanying group (fig. 3), the first two represent different forms of salivary glands, the third is a reproductive gland, while the fourth and fifth are glands yielding the acrid matter which some insects secrete.

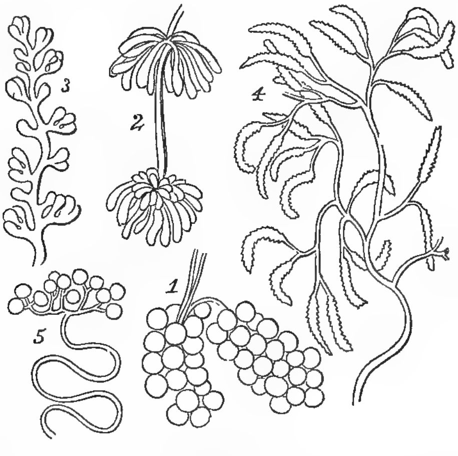


Fig. 3.

1, part of the salivary gland of Nepa Cinerea (after Ramdohr); 2, salivary vessel of Cicada Ormi (after Succow); 3, testes of Staphylinus Maxillorus; 4, secreting gland of Chlænius Velutinus; 5, secreting gland of Calathus Fulvipes.

To understand the structure of a complex gland like the liver or kidney, it must be followed from the simplest form in which it is known to occur through its various degrees of complication. In this way the liver may be traced, from the lowest mollusca (where it exists as simple follicles, lodged in the walls of the stomach, and pouring their product into its cavity by separate orifices) up to man, in whom it is an organ of extreme intricacy; and similarly in the early fœtal state of the higher animals, the liver and other secreting organs more or less resemble the persistent state of those parts in animals lower in the animal scale. In the same way, the Mammary Gland (q. v.), which is a structure of considerable complexity in the higher mammals, presents a very simple arrangement in the lowest type of this class, the ornithorhynchus, being merely a cluster of cæcal follicles, each of which discharges its contents by its own orifice.

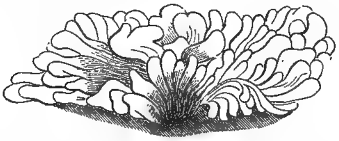


Fig. 4.—Mammary Gland of Ornithorhynchus.

Sometimes a gland has several ducts (as, for example, the lachrymal gland), but, as a general rule, the most important glands have only a single canal, formed by the union of the individual ducts, which conveys away the product of the secreting action of the whole mass.

Whatever be the complexity in the general arrangement of the elements of a gland in the higher animals, these elements are always found to resolve themselves into *follicles* or *tubuli*, which enclose the true secreting cells.

The second class of glands resemble the secreting glands in external conformation, and in the possession of a solid parenchymatous tissue, but differ from them in the absence of a duct or opening for the removal of the products of secretion; and indeed, except in the case of the thymus, no material resembling a secreted product is yielded by any of them. In all of them, the tissue mainly consists of cells and nuclei, with a great abundance of blood-vessels. They may probably be regarded as appendages to the vascular system; and from the absence of any excretory duct, they have received the name of *vascular ductless glands.*

The *Lymphatic Glands* belong to a different class of structures, and will be described in the article on the LYMPHATIC SYSTEM.

GLANDS, DISEASES OF. The lymphatic glands are subject to enlargement from acute inflammation and abscess, usually in consequence of irritation of the part from which their lymphatics spring, as in the case of scarlet fever, in which the glands of the throat are affected; in gonorrhœa, the glands of the groin, &c. The treatment of such abscesses belongs to the ordinary principles of surgery. See ABSCESS. A much more troublesome affection of the glands is the slow, comparatively painless, at first dense solid swelling which they undergo in Scrofula (q. v.), which tends very slowly, if at all, to suppuration, and sometimes remains for years. In Syphilis (q. v.) and Cancer (q. v.), there are also enlargements of the lymphatic glands. Scrofulous or tubercular disease of the mesenteric glands in children constitutes Tabes mesenterica (q. v.). The larger glands, as the Liver, Kidney, Pancreas, Spleen, Thyroid, Thymus, Testicle, and even the Pituitary Gland, have all their special diseases, which will be noticed, so far as necessary, in treating of these organs.

GLA'NVILLE. The earliest treatise on the laws of England, *Tractatus de Legibus et Consuetudinibus Angliæ,* is written by Glanville. Of this work, Professor Robertson says (*Hist. of Charles V.*), that it is supposed to have been the first undertaking of the kind in any country in Europe. It was composed about 1181. The author is generally supposed to have been Ranulphus de G., chief-justice in the reign of Henry II. Sir Matthew Hale, while he admits the date of the work to have been in the reign of that monarch, appears to hesitate to ascribe the authorship to the chief-justice. Lord Campbell (*Lives of the Chief-Justices,* i. 25) remarks that G., in some points, is still of authority, 'and may be perused with advantage by all who take an interest in our legal antiquities. This author is to be considered the father of English jurisprudence. Bracton, who writes in the following century, is more methodical, but he draws largely from the Roman civil law, and is often rather speculative; while Glanville actually details to us the practice of the Aula Regis in which he presided, furnishes us with a copious supply of precedents of writs and other procedure then in use, and explains with much precision the distinction and subtilties of the system which, in the fifth Norman reign, had nearly superseded the simple juridical institutions of our Anglo-Saxon ancestors.' This work was first printed in the year 1554, at the instance of Sir W. Stanford, a judge of the Common Pleas. The treatise of G. closely resembles the Scottish *Regiam Majestatem* (q. v.). 'The latter,' says Coke (*Inst.* iv. 345), 'doth in substance agree with our Glanville, and most commonly *de verbo in verbum,* and many times our Glanville is cited therein by special name.' A dispute has arisen, in consequence of this close similarity, as to which country shall claim the honour of producing the original work. Mr Erskine does not hesitate to claim the distinction for Scotland; but Lord Stair, following the opinion of Craig, frankly admits 'that those books, called *Regiam Majestatem,* are no part of our law, but were compiled for the customs of England, in thirteen books, by the Earl of Chester, and by some unknown and inconsiderate hand stolen thence, and resarcinate in those four books which pass amongst us' (Stair, i. 1, s. 16).

GLA'RUS, a canton in the north-east of Switzerland, is triangular in shape, and is bounded on the N.-E. by the canton of St Gall, on the S.-E. by that of the Grisons, and on the W. by those of Schwytz and Uri. It has an area of 262 square miles, and in 1860, it had 33,459 inhabitants, of whom 5866 were Catholics, the others almost all Calvinists. The surface is mountainous, the highest peak being that of Tödiberg or Dödiberg in the south-west, which reaches a height of 11,880 feet. From the foot of this mountain, the Linth, the chief river, flows north-north-east, through the middle of the canton, and empties itself into the Lake of Wallenstadt. The principal valleys, after that of the Linth, are the Sernfthal and the Klönthal, both formed by tributaries of the Linth. The climate is very severe, and only one-fifth of the land is arable. This canton, in which the rearing of cattle was formerly the main pursuit of the inhabitants, is now an important manufacturing district. The principal manufactures are cotton, woollen, muslin, and silk goods, and paper and slates. Great part of the manufactures are exported to the East, to North Africa, America, and China. The green cheese called Schabziger, which is wholly made here, and other agricultural products, are exported. In none of the Swiss cantons does the population so slowly increase as in that of Glarus. The old homely manners, and many even of the customs of antiquity, still prevail among the people. In the earliest times, G. was reckoned sometimes as a part of Rhœtia, sometimes as a part of Swabia, and was peopled by German settlers. After various changes, it passed into the possession of the Dukes of Austria, but ultimately secured its independence by the victories of Näfels in 1352 and 1388, when it joined the Swiss confederation. The chief town is Glarus, with a large Gothic church, which serves both for Catholics and Protestants and in which Zwingli was parson from 1506 to 1516. Pop. 4082.

GLA'SGOW, the industrial metropolis of Scotland, is, after London, one of the largest and most important cities in the kingdom. It is situated on the Clyde, in the lower ward of Lanarkshire, and occupies chiefly the north side of the river, but has large and populous suburbs on the south side. The river is crossed by three stone bridges, two of which are of granite, measuring 60 feet in breadth over the parapets, and much admired for their light and graceful architecture, and by two suspension-bridges for foot-passengers, each of a single span. Below the bridges, there are ferry-boats plying at all hours.

The ground upon which G. is built is, for the most part, level, but in the north and north-west districts, there are considerable elevations. Owing to the number of cotton-factories, chemical works, foundries, and work-shops of all kinds, the city has a somewhat dingy and smoky aspect; while many of the streets are continually thronged with passengers, and noisy with carts, cabs, and omnibuses. In other respects, it has many attractions. The houses facing the river stand well back, leaving spacious thoroughfares on each side, and affording full and noble views of the bridges, of several handsome street ranges and public buildings, and of the harbour with its steaming funnels and forests of masts. Most of the leading streets run from east to west, parallel with the river, and almost all the streets, except in the oldest parts of the city, are laid off in straight lines. The houses are generally lofty, and built of freestone, the floors of each tenement being usually occupied by separate families, entering by a common stair. In the fashionable quarters, what are called 'self-contained' houses prevail. G. has comparatively few squares or other open spaces; but it has three public parks—two of them of great extent, and the third of great beauty—namely, the Green (140 acres), occupying the level next the Clyde at the east end; Queen's Park (upwards of 100 acres), finely situated on a rising-ground to the south; and Kelvingrove (40 acres), rounding the face of a hill crowned with noble terraces, and sloping down to the Kelvin, at the west end. The city is about three miles in length from east to west, and is about eight miles in circumference.

G. had its first nucleus in the cathedral, and afterwards in the university, both in the north-east part of the city—the former on a height on the banks of the Molendinar stream, which runs between the old burying-ground and a steep rocky eminence formerly known as the Fir Park, but now transformed into the Necropolis, a modern cemetery, studded and crowned with monuments. It is from this ravine that the name G. is supposed to have been derived, etymologists professing to find in it two Celtic words signifying a 'Dark Glen.' St Kentigern, or St Mungo, founded a bishopric on the banks of the Molendinar about 560; but for more than five hundred years afterwards, the history of the place is a blank. About the year 1115, David, prince of Cumbria (afterwards king of Scotland), restored the see, and appointed his preceptor, John, to the bishopric, who laid the foundations of a cathedral, which was replaced by the present pile, founded by Bishop Jocelin in 1181. In 1190, King William the Lion erected G. into a burgh, with the privilege of an annual fair; but for a century and a half later, it continued an insignificant town of not more than 1500 inhabitants. In 1345, Bishop Rae built the first stone bridge across the Clyde; and in 1451, Bishop Turnbull established the university, having obtained a bull for that purpose from Pope Nicholas V. The latter event gave a considerable impetus to the place; yet, in 1556, G. only ranked eleventh in importance among the towns of Scotland.

The city as it now exists is almost wholly modern, having quintupled in dimensions during the last 60 years. This immense growth has arisen from its situation in the midst of a district abounding in coal and iron, and from the facilities afforded by the Clyde for the cultivation of a world-wide commerce. At the same time, it must be admitted that much of its prosperity is due to local ingenuity and enterprise. It was here that James Watt, in 1765, made his memorable improvement on the steam-engine; it was here that Henry Bell, in 1812, first (in the old world) demonstrated the practicability of steam-navigation. On the widening and deepening of the river, so as to render it navigable by vessels of 2000 tons burden, an enormous sum has been expended. The harbour of Port-Dundas, on the Forth and Clyde Canal, situated on the high ground north of the city, has likewise afforded facilities to its commerce. The enterprising spirit of the inhabitants began to manifest itself during the 17th century. Sugar-refining, the distillation of spirits from molasses, and the manufacture of soap, were among their earlier industries. The opening up of the American colonies to Scotch enterprise after the Union gave an immense increase to its commerce. G. became the chief emporium of the tobacco trade, and its Virginian merchants formed a local aristocracy, remarkable for wealth and *hauteur*. This trade was at length paralysed by the American war; but sugar cultivation in the West Indies, and the introduction of the cotton manufacture, opened up new paths to opulence. Calico-printing, turkey-red dyeing, beer-brewing, and other branches followed; and with the rapid expansion of the iron trade, including machine-making and steam-boat building, the city has attained its present magnitude. Among its thousand chimney-stalks, there is one of 460 and one of 450 feet, being the highest in the British dominions. The latter carries aloft the noxious vapours of St Rollox, the largest chemical works in the world, covering 12 acres of ground, and employing upwards of 1000 men.

In all that relates to lighting, paving, sewerage, and the like, G. deserves laudatory mention. The city is governed by a lord provost, 8 bailies, and 39 councillors, to whom are added the dean of guild from the Merchants', and the deacon-convener from the Trades' House. The sheriff and four sheriff-substitutes exercise within the city a co-ordinate jurisdiction with the magistrates, and preside over various civil and criminal courts. Much of the spirit which characterises the manufacturing and commercial affairs of G. has been carried into its municipal arrangements. Corporation halls, comprising a valuable gallery of paintings, have been secured for the citizens; public parks have been purchased at great cost, and laid out in a style of unsurpassed beauty; and a supply of water has been introduced from Loch Katrine at the bountiful rate of 21,000,000 gallons a day. G. has 20,260 registered voters, and sends two members to parliament.

Many of the public buildings deserve notice. The cathedral, which has lately been restored, and the windows enriched with stained glass, chiefly from Munich, is one of the finest First Pointed churches in the kingdom. The Royal Exchange, in Queen Street, several of the banks, and many of the churches, likewise present fine specimens of architecture in a variety of styles. G. has three equestrian statues, one of William III. at the Cross, another of the Duke of Wellington in front of the Royal Exchange, and the third of Queen Victoria in St Vincent Place. The last two are by Marochetti. In the Green there is an obelisk, 144 feet high, to Nelson, forming a conspicuous object in the landscape. This tall structure, which stands quite alone, has been twice struck by lightning, once in 1810, and again in 1861. In George's Square there are a column surmounted by a statue of Sir Walter Scott; a fine statue of Sir John Moore, by Flaxman; a statue of James Watt, in a sitting posture, by Chantrey; and a statue of Sir Robert Peel, by John Mossman. A marble statue of Pitt, by Flaxman, has lately been removed from the old town-hall at the Cross to the new Corporation Galleries, Sauchiehall Street. Charitable institutions and benevolent societies abound; and zealous and successful efforts have lately been made to provide cheap and innocent amusements for the working-classes. There are two theatres, two museums, and numerous halls in which soirées and concerts are held almost nightly during winter. The wealthier inhabitants migrate to the coast in shoals during the summer, and cheap Saturday excursions by river and rail are extensively taken advantage of by the working-classes. To the north-west of the city is a botanic garden of about 40 acres, which is thrown open every summer, during the fair holidays, at a merely nominal charge. In the fair week of July 1861, the number of visitors to the garden amounted to 17,344. Besides the Necropolis, there are several other garden cemeteries in the vicinity, of which Sighthill, occupying a northern elevation, is the most picturesque.

G. has three daily, and upwards of a dozen weekly newspapers. It has 175 churches and chapels, viz.: Established Church, 40; Free Church, 43; United Presbyterian, 37; Roman Catholic, 12; Independent, 9; Baptist, 7; Episcopalian, 5; Reformed Presbyterian, 4; other bodies, 18. In 1801, the population was 83,769; in 1861, it amounted to 446,639; and it is now estimated at nearly half a million.

GLASGOW, THE UNIVERSITY OF, was founded in 1451 by Bishop Turnbull, who procured a bull of ratification from Pope Nicholas V. In 1460, James first Lord Hamilton, endowed a college on the site of the present buildings, the older portions of which were erected between 1632 and 1656. During the stormy times of the Reformation, the university was well-nigh destroyed. Queen Mary exerted herself to restore the tottering institution: she bestowed on it the manse and kirk of the Preaching Friars, with 13 acres of adjacent ground. In 1577, James VI. endowed it with the rectory and vicarage of the parish of Govan, and granted a new charter, which still continues in force. The professoriate, which was originally limited, gradually increased with the intellectual necessities of the times and the advancement of learning and science.

Chairs, Office-bearers, Degrees.—The office-bearers of the university consist of Chancellor, Rector, Principal, and Dean of Faculties. The Chancellor, holds his office for life, and up to the present time has been elected by the senate; but the next, and all future elections, will take place by the university council, as in Edinburgh University; the Rector is elected triennially by the matriculated students, who are divided, according to their place of birth, into four nations—*Glottiana* (Lanarkshire), *Transforthana* (Scotland north of the Forth), *Rothseiana* (Buteshire, Renfrewshire, and Ayrshire), *Londoniana* (all other places). The Dean of Faculties is elected annually by the senate. The duties of Chancellor and Rector are chiefly honorary. The chairs are Latin, Greek, Mathematics, Logic, Natural Philosophy, Moral Philosophy, English Language and Literature, Anatomy, Physiology, Materia Medica, Practice of Physic, Natural History, Chemistry, Clinical Surgery and Medicine, Midwifery, Botany, Surgery, Oriental Languages, Divinity, Church History, Biblical Criticism, Civil Law, Conveyancing, Civil Engineering, and Practical Astronomy. The degrees granted are Master of Arts, Doctor of Medicine, Master of Surgery, Bachelor of Divinity, Doctor of Divinity, Doctor of Laws, and Bachelor of Laws, the last three being honorary degrees. —The ceremony of graduation was of old conducted with no little pomp through all its stages, from its beginning in what was called 'the Black Stone Examination,' to its close in the act of 'Laureation' in the College Hall, or one of the city churches. The number of matriculated students now averages about 1200; they reside outside the college walls; and those in attendance on classes in the Faculty of Arts wear scarlet gowns.

Bursaries and Exhibitions.—The Senatus Academicus has in its gift about 30 bursaries, and the funds attached to several of these are applicable to from four to six students: their yearly values range from £6 to £50, and some may be held for a period of four years. *The Oxford Exhibition.*—In 1677, John Snell, a native of Ayrshire, afterwards of Uffeton in Warwickshire, presented the university with an endowment, consisting of a landed estate, for the purpose of supporting at Balliol College, Oxford, ten students who had previously studied at Glasgow. The property was let in 1809 on a lease of 21 years, at an annual rental of £1500, and the ten exhibitioners received £133, 6*s.* 8*d.* per annum each.

Libraries, Museums, &c.—The library was founded prior to the Reformation, and now contains about 105,000 volumes. It is supported from the interest of sums bequeathed by individuals, from graduation fees, and from contributions of students. Subsidiary libraries are attached to several of the classes, the books being selected with a view to the subjects treated of in each class. In July 1781, the celebrated Dr William Hunter of London framed a will, leaving to the principal and professors of the university his splendid collection of coins, medals, and anatomical preparations; and for the accommodation and conservation of these, a building was erected in 1804 within the college precincts at a cost of £12,000. The university also possesses an observatory and a botanical garden, and several of the professors have collections of apparatus attached to their classes, illustrative of the courses there delivered.

Eminent Professors and Students.—Among the men of eminence who have taught or studied in the university, are Bishop William Elphinstone, John Major, John Spottiswoode, Andrew Melville, James Melville, Robert Boyd of Trochrig, John Cameron, Zachary Boyd, Robert Baillie; James Dalrymple, first Viscount of Stair; Gilbert Burnet, bishop of Salisbury; Dr John Douglas, bishop of Salisbury; Dr Robert Simson, Francis Hutcheson, Dr William Hunter, Dr James Moor, Dr Adam Smith, Dr Thomas Reid, Dr William Cullen, Dr Joseph Black, Dr Matthew Baillie, Professor John Miller, Thomas Thomson, Francis Jeffrey, John Gibson Lockhart, Sir William Hamilton.

GLASS, from the Fr. *glace* (Lat. *glacies*), ice, which it resembles in its transparency. Glass is essentially a combination of silica with some alkali or alkaline earth, such as lime, barytes, &c. Generally speaking, it is understood to be a silicate of soda, or a combination of silica or flint with one or more of the salts of sodium, with the addition, for some purposes, of certain metallic oxides and other substances.

History.—The invention of glass dates from the earliest antiquity, and the honour of its discovery has been contested by several nations. As the oldest known specimens are Egyptian, its invention may with great probability be attributed to that people. It is mentioned as early as the 5th or 6th dynasty, and called *bashnu*, the Coptic *bijni;* and articles made of it are represented in the tombs of the period; while its fabrication is depicted in sepulchres of the 12th dynasty —i. e., about 1800 B. C. The glass of Egypt was generally opaque, rarely transparent, and always coloured, the articles made of it being of small size, and principally for adornment, as beads, vases, small figures, and objects for inlaying into wood or other material. Specimens exist of this glass bearing the name of the queen Hatasu of the 18th dynasty, 1445 B. C., and vases of blue glass, with wavy lines in white, light-blue, yellow, black, red, and green, of that and a later age, have been discovered. The Egyptians also successfully imitated precious and other stones in glass—as emeralds, lapis lazuli, turquoises, jaspers, onyx, and obsidian; for this purpose, they used nearly the same materials as at present, employing manganese, copper, iron, cobalt, gold, and tin. Transparent glass, indeed, does not appear earlier in Egypt than the 26th dynasty, about 750 B. C., when bottles and a few other objects—as figures for inlaying, and beads imitating gems—were made of it. According to Herodotus, the Ethiopians, two centuries later, placed their mummies in glass coffins; but the fact has never been proved by any as yet discovered.

Under the native Pharaohs, Egyptian glass seems to have been extensively exported to Greece and Italy, and its reputation still continued under the Ptolemies, when the furnaces of Alexandria produced glass vases of numberless shapes and considerable size. At this period, the Egyptians invented the *millefiori* glass, consisting of small threads of glass arranged vertically and then fused, so that the whole rod thus formed was of one pattern; and by cutting off slices, each piece reproduced the same pattern. The glass beads of *madrepore* glass, which are found in the tombs of Greece and Italy, and are formed by placing slices of such rods in a mould and fusing the whole, are probably of Egyptian or Phœnician origin. Egypt still retained the pre-eminence in the manufacture of glass under the Romans, the sand of Alexandria being indispensable for the finest qualities, and it exported glass to Rome. Hadrian, on his visit, was struck with the activity of the manufacture, and sent to his friend, the Consul Servianus, one of the vases, called allosontes, or 'opalescent;' and the Roman writers mention with admiration the melting, turning, and engraving of Egyptian glass. To the most flourishing period of the empire are to be referred certain vases and slabs with white camei figures of fine execution in relief on a blue background, and plates of opaque glass for inlaying the walls of rooms, such as those which are said to have decorated the mansion of the usurper Firmus. The art of glass-making, in fact, has never become extinct in Egypt, the Fatimite Califs having issued glass coins in the 10th and 11th centuries, and beautiful lamps of glass enamelled on the surface with various colours having been made in the 14th century. Although the art of glass-making has fallen to the lowest ebb in Egypt, the workmen are said to manifest considerable aptitude in its production.

After the Egyptians, the people of antiquity most renowned for glass were the Phœnicians, who were the legendary inventors. Certain of their merchants, it is said, returning in a ship laden with natron or soda, and having been compelled by stormy weather to land on a sandy tract under Mount Carmel, placed their cooking-pots on lumps of natron on the sand, which, fused by the heat of the fire, formed the first glass. Sidon, indeed, was long celebrated for her glass-wares made of the sand brought down from Mount Carmel to the mouth of the river Belus. The nature, however, of the earliest Phœnician glass is unknown, unless the opaque little vases of the toilet found in the tombs of Greece and Italy, and the beads of the same discovered in the barrows and tumuli of the old Celtic and Teutonic tribes, were imports of the Phœnicians. The vases of Sidon were, however, highly esteemed at Rome under the Antonines, fragments of bowls of blue and amber glass, with the names of the Sidonian glass-makers, Artas and Irenæus, stamped in Latin and Greek, having been found in the ruins. Perhaps the Assyrian glass vases were made at Sidon; at all events, the earliest dated specimen of transparent white glass is the vase having upon it stamped or engraved in Assyrian cuneiform a lion and the name of Sargon, who reigned 722 B.C., found at Nimrud by Mr Layard; and glass seems to have been imported or even made in Assyria as late as the time of the Parthians, when Nineveh became the Roman colony of Claudiopolis. Under the Sassanides, moulded glass vessels, elaborately decorated, were made, as is shewn by the cup of Chosroes, 531—579 A.D., in the Louvre; and Persia continued to manufacture glass vessels in the Middle Ages. The Arabs seem to have derived their glass from the Byzantines, and specimens introduced into Europe by the Crusaders were called in royal and other inventories Damascus glass; this was coloured, and not plain. Although the art of glass-making appears to have been practised in remote times, this nation does not appear to have attained any proficiency in it, and is content at the present day to re-melt European glass; while some of its highest efforts do not exceed the imitation of jade, and other stones. There is still an extensive use of glass-beads in the East, which are chiefly made at Khalib or Hebron. Glass was equally unknown to the Hindus, except the production of a few trinkets and inferior objects, till the settlement of Europeans in India; and the country was, at the remotest period, supplied by Phœnician, and, in the Middle Ages, by the Venetian traders. Although Josephus claims the invention of the art for the Jews, no remains of Jewish glass are known, and it is probable that the Jews were principally indebted for their supplies to the neighbouring cities of Tyre and Sidon. Even in Greece itself, glass was by no means ancient. In the days of Homer it was unknown. Herodotus, indeed, mentions its employment for ear-rings, but these may have been of Phœnician fabric. It was called *hyalos*, crystal or ice, and *lithos chyte*, or fusible stone. Aristophanes, 450 B.C., mentions glass or crystal vessels, and various inscriptions confirm its use, but its value was next to gold, which could hardly have been the case if it had been of native manufacture. In the 4th c. B.C., Pausias, a celebrated painter, had depicted *Methe*, or 'Intoxication,' drinking from a transparent glass bowl which revealed her face. Glasses and plates, amphoræ and diotæ, large two-handled jars, were made of it, and also false stones for finger-rings, called *sphragides hyalenai*. These last, called by archæologists *pastes*, were imitations of engraved stones in coloured glasses, used for the rings of the poorer classes, and were no doubt often copies or impressions of engraved stones of celebrated masters; false gems and camei having a subject in opaque white, sometimes like the sardonyx, with a brown layer superposed on the parts representing the hair, and the whole laid on a dark-blue ground, appear before the Christian era. Lenses were also made of glass, and the celestial sphere of Archimedes was made of the same material. The supposed Phœnician coloured glass vases for the toilet, found in the oldest sepulchres of Greece, it must be observed, have Greek shapes. Glass-makers, *hyalopsoi*, *hyalepsæ*, are also mentioned

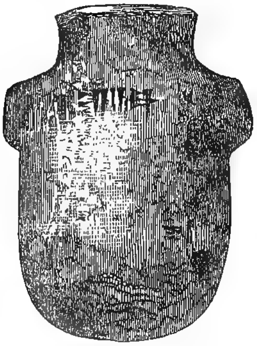


Fig. 1.—Glass Vase, bearing the name of Sargon, from Nimrud.

at a later period, when there can be no doubt the art was practised. Of the Alexandrian glass, mention has been already made; and the body of Alexander the Great was shewn to Augustus in a glass coffin.

The glass-making art in Italy does not date earlier than the commencement of the Roman Empire, importations from Sidon and Alexandria having previously supplied the want of native manufacture; but there is ample evidence of its extensive manufacture at that period having been introduced in the days of the Ptolemies, large plates being used for incrusting chambers, *vitreæ cameræ;* and hollow columns, made of this material, with lamps inside, were used to illumine the public theatres. As early as 58 B.C., the theatre of Scaurus had been decorated with mirrors or glass plates, disposed on the walls. Glass was also used for paving, and for the blue and green tesseræ of mosaics (see Mosaic). Window-glass does not appear till about the 3d c. A.D., the houses at Herculaneum, destroyed in the reign of Titus, being glazed with talc, and some doubt remaining as to the use of glass for this purpose at Pompeii. Lactantius in the 3d c. A.D.; St Jerome, 422 A.D., mention glass windows. Older windows of this material are said to have been found at Ficulnea, and even in London. Under the Romans, coloured as well as white glass was extensively used; it had a greenish tint in the first days of the Empire, but had sensibly improved in colour and quality in the days of Constantine. The first production of a white glass like crystal was in the days of Nero. Its use was most extensive, and it was either blown or stamped according to the objects required. Glass vases, *vasa vitrea escaria potoria,* are mentioned. So are costly cups of many colours, purple ones of Lesbos, and balsamarii, especially the kind long called lachrymatories, which held perfumes, medicine, drugs, and other substances like modern vials, amphoræ, ampullæ, pillar-moulded bowls, bottles for wine (*lagenæ*), urns (*urnæ*) for holding the ashes of the dead, and pillar-moulded bowls or cups (*pocula*).

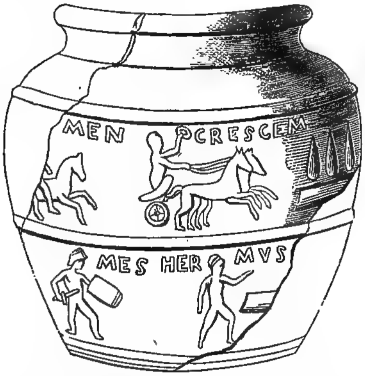


Fig. 2.—Moulded Glass Roman Cup, with the Circus and Gladiators, found in London.

Besides these articles of amusement and luxury, hair-pins, beads, rings, balls, draughtsmen, dice, knuckle-bones (*astragali*), mirrors, multiplying-glasses, prisms, magnifying-glasses, telescopes, and water-clocks were made of this material.

Many vases are stamped, and some, principally of square shape, have the initials and devices of their makers or contents, as eye-waters, impressed on the bottom. Most of the precious stones were successfully imitated in glass pastes; and the Empress Salonina was egregiously cheated by a fraudulent jeweller. But the most remarkable works in glass are the camei vases (*toreumata vitri*); of which the most celebrated is the Portland vase in the British Museum, a two-handled vessel about 10 inches high, of transparent dark-blue glass, coated with a layer of opaque white glass, which has been treated as a cameo, the white coating having been cut down, so as to give on each side groups of figures delicately executed in relief. The subject is the marriage of Peleus and Thetis, and the urn held the ashes of a member of the imperial family of Severus Alexander, who died 221—235 A.D. This emperor had imposed a tax upon glass. It was found in a magnificent sarcophagus in the Monte del Grano, near Rome. A vase of smaller size, but of similar fabric, with arabesques, found at Pompeii, exists in the Naples Museum; and numerous fragments of even finer vases, some with five colours, exist in different museums. In the reign of Tiberius, an adventurer pretended that he had invented flexible glass, and threw down a vase which only bent, and which he readjusted with a hammer; he seems to have connected it in some way with the philosopher's stone, and the emperor is said to have banished him or put him to death. This invention is said to have been twice reinvented in modern times —once by an Italian at the court of Casimir, king of Poland. In the 3d c. A.D. appeared the *diatreta* or 'bored vases,' consisting of cups (*pouela*) having externally letters, and net-work almost detached from the glass, but connected by supports; all which must have been hollowed out by a tool, involving great labour. One vase of this class, bearing the name of Maximianus, who reigned 286—310 A.D., fixes their age. At a later period, bowls of engraved glass, having subjects of gladiatorial fights, came into use. Still later, apparently in the 5th c., a new style of glass ornamentation was introduced, consisting of the figures of Christ and legends of saints, and the portraits of private persons laid on in gold upon one layer of glass, over which was placed another through which they appeared. At the close of the Byzantine Empire, the glass art was still rich and ornamental. Achilles Tatius describes a vase which, when filled with wine, made the portion representing the bunches of grapes seem red, as if ripened by the autumn. The numerous beads called serpents' eggs or adder stones (*glain nerdryr*), found throughout Roman Britain, were imported by route of Gaul to Britain, or made in Britain. Glass was cheap under the Roman Empire, and Strabo informs us that in his days in Rome a glass cup and saucer only cost an *as* (about a half-penny). Such articles, indeed, can only have been of the commonest kind, as Nero is said to have paid 6000 sesterces, or about £50,000, for two cups of moderate dimensions. Aurelian made the Alexandrians pay a tax of glass. A peculiar white glass seems to have been made at Carthage under the Roman empire. Glass gems for rings (*vitreæ gemmæ*) were in most extensive use. Glass, however, was considered always something costly and rare, and is mentioned as

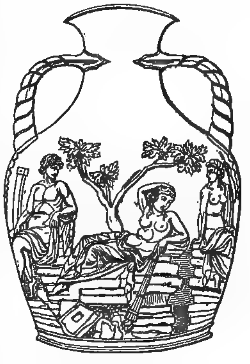


Fig. 3.—Portland Vase.

such in the *Revelations* and in the *Recognitions of St Clement*, in which St Peter is described as praying to see some marvellous columns of this material in the island of Aradus. At the close of the Roman Empire, only two kinds of glass appear to have been manufactured—bottles of a greenish glass in the west, and the *hyalina diachrysa*, or gilded glass of many colours, in the east. After that period, a few glass vessels have been found in the Anglo-Saxon graves of England, and Frankish sepulchres of France, of a peculiar fabric of green glass with projecting knobs, bent round to the body of the glass, and apparently a rude imitation of the *diatreta*. The Romans knew the use of soda and lead as fluxes for glass, and made both crown and flint glass. They made most of the fancy varieties at present in use, and were acquainted with the art of colouring it blue by cobalt, green by copper, rose or ruby by gold. Many of their imitations of gems and other fanciful colours were also of *Schmeltz* glass. But the great site of the glass manufactories of the dark and middle ages was Venice, whither it was transplanted on the foundation of that city in the 7th c. A.D. The art, however, seems to have improved on the conquest of Constantinople by the French in 1204, and in 1291 the establishments were removed to the island of Murano, the manufacturers forming a guild with a libro d'oro, or register of nobility, and the secret kept with the greatest jealousy. In 1436, their colour-glass came into note, and continued so till the close of the century; and in the 16th c., lace-patterns and mirrors were introduced. In the 15th and 16th centuries, plain glass with nice ornaments gilt and enamelled; in the 16th, crackled lace and reticulated glass, *vitrodi trino;* and in the 17th c., variegated or marbled glasses were produced. The *millefiori* glass extends through all periods, and seems to have been derived from the Roman, being continued to the present day, when large quantities of this glass are annually imported to England, and transported to Africa and Asia in the way of trade. The Venetian glass engaged for a long time the monopoly of commerce, their mirrors, goblets, and cups being exported all over the world, but it has been superseded by manufactures of England and Germany. The forms of the Venetian glass reflected its oriental origin, and the earlier glass of other countries of Europe in their turn shew the derivation of their art from Venice. In Germany, the oldest glass (which was flint) dates from the 16th c., and consists of goblets and tankards of white colour, enamelled with coloured coats of arms and other devices, millefiori, and schmeltz glass. Engraved glass was first introduced by Caspar Lehmann at Prague in 1609 under imperial protection, and continued by his pupil G. Schwanhard; and ruby glass by Kunckel in 1679. Glass is said to have been made in 1294 at Quinquengrone, in Normandy, before the 16th c., in the reign of Philip VI.; and John and the Dukes of Lorraine established manufactories in their domains, and a common kind was made in Dauphiny and Provence. Cast plate is also said to have been established at Cherbourg by artists from Venice, and in 1688 the art was declared noble. Potash, lime, silica, and no lead was employed. Thevart introduced glass casting and plate-glass works at Paris. In France, oxide of lead flint-glass was made at St Cloud in 1784; another manufactory was subsequently established at St Louis in 1790; and the St Cloud establishment was removed to the vicinity of the Mont Cenis, where it flourished till 1827. It is uncertain whether glass was made in England before the 16th c., as that mentioned may have been imported from Flanders or Venice. Window-glass is mentioned by Bede in 674, but was not in general use for windows till the 15th century. In 1557 flint-glass was manufactured at the Savoy and Crutched Friars; in 1565, there were glass-works under Cornelius de Launoy; and in 1567, Jean Quarre and other Flemish manufacturers established works at Crutched Friars, which Quarre's descendants extended to Sussex. In 1615, Sir R. Maunsell obtained a patent for making glass, in consideration of using pit coal instead of wood, and oxide of lead was then introduced in 1635; and in 1673, Venetian artists, brought over by the Duke of Buckingham, manufactured mirrors of plate-glass at Lambeth, and drinking-glasses were made at this period. But Venetian glass was extensively imported. In 1771, the company of British Plate-glass Manufacturers was established at Ravenhead, near Prescot, Lancashire; and in 1728, plate-glass was made by the Cooksons at South Shields, and the Thames Plate-glass Company in 1835—1836. Patent plate was first made in 1840. In Scotland, the manufacture was introduced in the reign of James VI., and George Hay obtained a patent for 31 years. The first glass was manufactured at Wemyss, in Fifeshire, afterwards at Prestonpans and Leith. In 1661, only the principal chambers of the king's palace had glass. In America, attempts seem to have been made to establish glass-works in 1746 at Jamestown, Virginia; subsequently, in 1780, at Temple, New Hampshire; in 1789, at Newhaven; and in 1809, at Boston. Plate-glass was first made there in 1853. It is made at Boston, Baltimore, and New York.

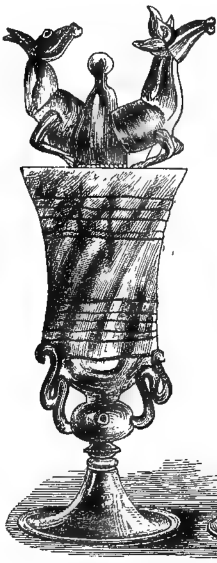


Fig. 4.—German Drinking-glass.

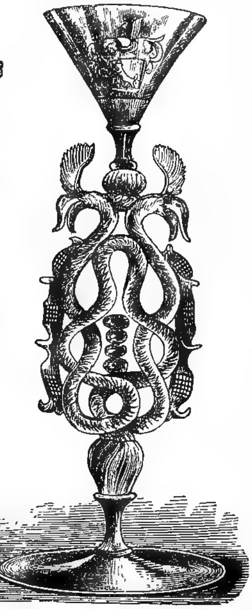


Fig. 5.—Venetian Glass on open-work stem.

At an early period the application of glass for magnifying lenses appears to have been known. Ptolemy II. had a telescope mounted at the Pharos, and globes filled with water were in use for the purpose of magnifying under the Romans. Lenses are mentioned in the 12th c. A.D. by Alhazan, and by Roger Bacon in the 13th c.; towards the close of which, Salvino d'Armato invented eye-glasses, which were subsequently improved by Alessandro

Spina. Within the present year (1862), glass-reflectors for telescopes, of great size and accuracy, have been made in France. See Telescope.

As regards processes of making, that called the cylindrical was used by the ancients, and is mentioned by Theophilus at the end of the 12th century. The rotatory process was first introduced in Bohemia, subsequently into France in 1730, but not into England till 1832. Pressed glass was invented in America. In England, the tendency has been to throw the trade into fewer hands, there having been 24 window-glass factories in 1847, and only 8 in 1858; but the value of the export increased from £26,694 in 1848 to about £500,000 in 1855.—Franks, A. W., *Vitreous Art in the Art Treasures of the United Kingdom* (Manchester) *Exhibition* (4to, 1858); Pellat, A., *Curiosities of Glass-making* (4to, Lond. 1849); *Exhibition of Works of Industry of all Nations* (1851); Reports of Juries (1852), *Cl.* xxiv. p. 521.

Manufacture.—The manufacture of glass, as at present carried on, may be classed under the following heads: Bottle-glass, Crown Window-glass, Sheet Window-glass, Plate-glass, Flint-glass, Coloured-glass. The first is the coarsest kind in common use. In this country, it is made generally of soap-makers' waste (which contains a quantity of soda-salts), fresh-water river-sand, brick-dust, calcined-lime, and marl; to these a quantity of *cullet*, or the broken glass of the works, is always added at a certain stage of the manufacture. This is the mixture employed in making what are called *black bottles*, used for wine, beer, &c. Of late years, light-green coloured glass has been preferred for many purposes, such as medicine bottles, soda-water bottles, &c. This colour is commonly produced by adding a large proportion of the cullet of crown-glass, which, by its light colour, dilutes the darker material; if, however, it is wanted of a finer quality, it is made of sand of a light colour, containing only about two-tenths per cent. of the oxide of iron. To 50 parts of this sand are added 20 parts of heavy spar (*Sulphate of Baryta*), 30 parts of soap-makers' waste, and about two-tenths per cent. of oxide of manganese.

In France, kelp and wood-ashes are used to furnish the alkaline portion of the mixture; in other respects, the material is essentially the same. In Germany, where a rich brown tint is in fashion for bottles for the light-coloured Rhine wines, the materials consist of a light-coloured clay, 16 parts; a light yellow-coloured sand, 20 parts; kelp, 8 parts; wood-ashes, 38 parts; cullet, 15 parts; and oxide of manganese, 3 parts.

One of the first essentials to a successful manufacture of glass, is the preparation of the melting-pots. These pots are composed of clay, which is required to be as free as possible from lime and iron. A clay obtained from the carboniferous shales of Worcestershire, in the neighbourhood of Stourbridge, is the most esteemed for this purpose; it consists of pretty nearly equal proportions of silica and alumina. The clay is carefully dried and sifted, after which it is mixed with hot water, and worked into a paste; it is then transferred to the kneading-floor, and when sufficiently kneaded—which is done by men treading it with naked feet—it is laid in large masses in a damp store-cellar to *ripen*, a process the theory of which is not well understood. When required for forming the pots, a sufficient quantity is taken and again kneaded with one-fourth of its quantity of the material of old pots, which are ground to fine powder and carefully sifted; this material gives firmness and consistency to the paste, and renders it less liable to be affected by heat. The pots are of two kinds, the open (fig. 6) and the covered (fig. 7). The first is used for melting common glass, such as window and bottle glass; the other for flint-glass. In each case, the pots are made by hand, and require great skill and care. The bottom is first moulded on a board. When the bottom is finished, the workman begins to build up the side of the pot by first forming a ring of the same height all round, taking care to round off the upper edge to a semicircular curve of great regularity; upon this he begins bending over other lumps of the paste until another equal layer is formed, and these are continued until the pot is complete; but the workmen do not work continuously at each pot until it is finished, they leave off from time to time, spreading wet cloths over the edge when they discontinue working. This is necessary, to admit of a certain amount of drying, otherwise the large weight of clay used would prevent the form from being kept, and the pot would fall to pieces, or lose shape seriously, the building of the pot is consequently extended over several days. Those made in the form of fig. 6 are from three to four inches thick, but the flint-glass pots are only from two to three inches. After the potter has finished his work, the pots are removed into the first drying-floor, where they are only protected from draughts, so that the drying may be conducted with the greatest possible uniformity. When they have progressed sufficiently, they are removed to the second drying-floor, which is heated with a stove, and the drying is here completed. They are then placed in the store, where usually a good stock is kept on hand, as time improves them, and they are seldom kept less than six or nine months. When required for use, they are placed for four or five days in the annealing furnace, which is on the reverberatory principle, and they are there kept at a red heat. This furnace is so situated, that the pots, when ready, can be most quickly transferred to the main furnace—an operation of exceeding difficulty, and requiring great skill and dexterity, as they have to be removed whilst red-hot, and it must be done so quickly that no sudden cooling shall injure the pot, a difficulty which can only be understood by remembering that the ordinary pots are nearly four feet in depth, are the same in width at the mouth by about thirty inches at the bottom, and they weigh several hundredweights. The enormous amount of labour bestowed upon these pots makes them very expensive, their value being from £6 to £10 each. Their removal from the annealing oven to the main furnace is effected by an immense pair of forceps several feet in length, which are placed horizontally upon an upright iron pillar about three feet in height, which rises from a small iron truck on four wheels, so that the whole apparatus can be easily moved from place to place. By means of this instrument the pot is lifted and dexterously withdrawn from the oven, and as quickly transferred to its position in the main furnace, in which usually four or six are placed on a platform of firebrick or stone, each pot being opposite to a small arched opening, through which it can be filled and emptied.

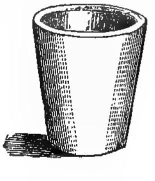


Fig. 6.

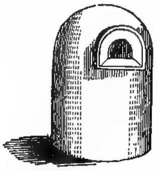


Fig. 7.

The entrance to the main furnace, through which the pots have been introduced, is then closed with a movable door of firebrick, and covered over with fireclay, to prevent the escape of heat; the pots in the furnace are filled with the prepared materials for glass, now called *frit*, mixed with about a sixth or eighth part of cullet or broken glass; the openings are closed temporarily for two or three hours, by which time the first charge of material has melted down, leaving room for a further supply, which is then thrown into the pot, and this is repeated two or three times until the pot is completely full. The openings are then closed, and the heat increased to the utmost for ten or twelve hours: this part of the operation is called *founding*, and the result of it is to perfectly melt and vitrify the materials. The heat of the furnace is now somewhat reduced, and the scum is removed from the surface of the melted material, now technically called *metal*, by a workman called the *skimmer*, whose labour requires great care and much experience, as the metal is at a glowing white heat, and is only with difficulty distinguishable in the fierce white glare of the furnace. The metal is now ready for the commencement of the *journey*, as the operation of working it up is called. This term, like most others in the glass trade, is derived from the French.

The arrangements so far apply equally to all kinds of glass. We now, however, return to the manufacture of glass bottles, in order the more fully to understand which, we give the following ground-plan of one of the *houses* in which this is carried on (fig. 8). *a* is the main furnace, which in this case is square, and made to hold only four pots; at each corner is an opening, which allows the fire to enter four small reverberatory furnaces, *b, b, b, b*, called *arches;* two are called the *coarse arches*, and the others the *fine arches*. In the two former, the soap-makers' waste is calcined at a red heat for at least four hours, or whilst a set of pots is being worked out—that is to say, one journey. Then the calcined material is ground and sifted in the grinding and sifting house, *h*, after which it is mingled with the sand, &c., and transferred to the fine arches, where for the term of another journey it is again calcined. At the end of that time, the pots being empty, are refilled with this material.

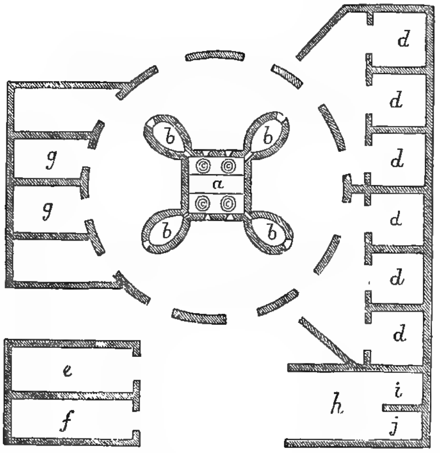


Fig. 8.

When the furnaces are opened for a journey, the skimmer first removes the scum, and makes the way clear for the *blower* and *moulder*, who takes his blow-pipe of iron, six feet in length, the part held in the hand being guarded by a covering of wood and other non-conducting materials. After heating the end of the blow-pipe in the furnace mouth, he dips it into the pot, and turning it round, gathers as much metal on the end as is sufficient to form a bottle of the size required. Usually, in bottle making, one gathering suffices, but in larger operations, such as blowing window-glass, more gatherings have to be made. The operator then blows gently down the pipe, and having thus slightly distended the bulb of red hot plastic glass (fig. 11, *a*), he takes it to a plate of polished iron, forming a low bench called the *maver*,' or *mavering table*. On this he turns it round, moulding the round lump of glass into a conical form, the change being represented in fig. 11, *b*. This operation, called *mavering*, is performed in all cases where glass is blown; and as it is necessary that the glass should be pretty firm before mavering, it is often cooled by sprinkling with water, and even, as in the case of window-glass and other large blowings, turning it in a cavity containing water, which is made by hollowing out a block of wood, usually, if attainable, that of the pear-tree, which is said to be best for the purpose.

After being mavered, the glass is held to the mouth of the furnace, and the operator blows down his blow-pipe, and further distends his glass. Formerly, he commenced moulding it into the form of a bottle with his shears, one arm of which was of charred wood, and the concave bottom was made by pushing a little piece of glass, called a *punty*, at the end of an iron rod called the *pointel;* the blow-pipe was then detached by a slight blow of the shears, and the partly formed bottle was left at the end of the pointel attached by the punty in the hands of a boy who attends upon the man, and brought and applied the punty. The man then took the pointel in one hand, and after softening the bottle in the mouth of the furnace, moulded the neck by means of his shears, regulating the size of the opening by means of a small brass mould, the size and shape of a cork, attached to the middle of the shears; heating the neck again, he formed with a small portion of metal from the pot the ring round the mouth of the bottle. Now, however, after mavering, and the first slight blowing, the operator inserts the glass into an iron or brass mould, which is formed in two pieces, opening or closing by the pressure of the foot on a lever. When the mould is closed, he blows down the pipe, and the bottle is completed all but the neck, the ring of which has to be formed by the addition of a fresh piece of metal, as before described. By this process, bottles are made with wonderful rapidity and exactness. At this stage of the manufacture, by either process, the bottles are taken from the workman by a little boy, who inserts the prongs of a fork into the necks, and carries them to one of the annealing arches, *d, d, d, d, d, d*, where they are carefully arranged in proper bins until the arch, which usually holds 144 dozen, is full; it is then closed, and the heat is raised nearly to melting point, and then allowed gradually to subside until it becomes cold, when the bottles are removed to make room for a fresh charge. In the plan, fig. 8, *e* and *f* are the sand and alkali stores; *g, g*, are stores for the prepared frit; and *i, j*, are sifting-cribs in the sifting-house.

Window-glass, whether *crown* or *sheet*, is made of much more carefully selected materials. They are slightly varied by different manufacturers, but the following are the ingredients used in one of the largest glass-houses in Great Britain: Sand (well dried), from the neighbourhood of Leighton Buzzard, in Bedfordshire; sulphate of soda, ground; subcarbonate of soda, white oxide of arsenic, manganese, Welsh anthracite, chalk; limestone from Hopton Wood, Derbyshire; nitrate of soda; cullet, about as much as is equal to an eighth part of the other ingredients. The exact proportions are only known to the manufacturers. Each ingredient is carefully powdered before mixing, and they are afterwards calcined or fritted, except the anthracite, which is added in the pot for the purpose of decomposing the sulphate of soda, and dissipating its acid; and the manganese and arsenic, which are only added in very small quantities, to improve the colour; too much, however, of each is sure to injure the glass, and therefore these materials can only be safely used by experienced manipulators. The bulk of the glass, however, consists of the sand, and carbonate and sulphate of soda.

The arrangement of the window-glass houses is different, and on a much larger scale than in the houses for bottle-glass, and excepting in gathering and mavering, all the operations subsequent to the founding are different. Fig. 9 will give a general plan of the house for crown window-glass, and fig. 10 gives an elevation of one side of the main furnace, with the three openings through which the glass is gathered from the pots. In fig. 9, *a* is the main furnace; *b*, *b*, two flashing furnaces; the projecting piece of brick-work, *b′*, being the screen which protects the workman from the fire; and *c*, *c* are two annealing furnaces or ovens.

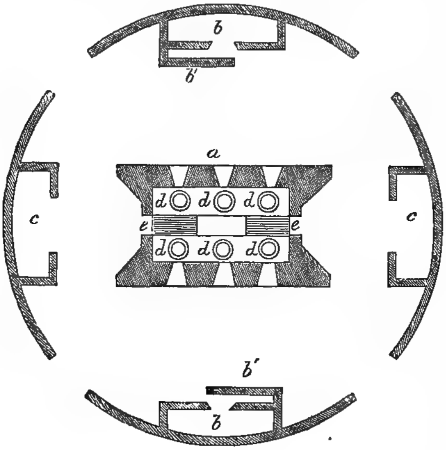


Fig. 9.

When the founding or melting and the skimming are completed, the workman takes his blow-pipe, which is about seven feet in length, heats it at the end, and dipping it into the pot of melted glass or *metal* through the opening (*a*, fig. 10), he *gathers*, by a slight turn or two, a quantity of glass, about a pound and a half in weight; this he withdraws, and after turning it about for a minute or two in the air until sufficiently cooled, he then dips it in again, and over the first he makes a second gathering, which increases the weight to about three pounds weight; the same cooling process is repeated, and a third gathering is made, which brings up the weight to about nine pounds; he then holds his blow-pipe perpendicularly with the glass downward, so that it may by its own weight pull downward from the pipe in the form of a symmetrical pear-shaped bulb; he next takes it to the hollowed block before mentioned, and turns it round in the water placed in the cavity by which it is made ready for the mavering table. The workman, by skilful management, *mavers* the bulb of glass into the form *b*, fig. 11, and then forms a little knob at its apex, by turning it on a fixed bar of iron called the *bullion bar;* he then commences blowing, and soon the bulb of nearly solid glass is expanded into a large hollow sphere (*c*, fig. 11), still, however, with the little nipple made by the bullion bar. A little boy now comes forward with an iron rod, the *pointel*, upon the end of which has been gathered a small lump of metal, called the *punty*, about the size of a hen's egg, this he applies to the nipple, to which it firmly adheres, the workman meanwhile resting his blow-pipe on a fixed rest called the *casher-box*, placed for the purpose; by the pressure of the pointil the globe of glass is flattened as in *d*, fig. 11. The application of a piece of iron, cooled for the purpose by keeping it in water, to the junction of the glass with the blow-pipe, detaches it instantly, and the globe of glass is now held with the pointil. The operator carries it next to the nose-hole (*b*, fig. 10), and presents the opening formed by the detachment of the blow-pipe, to the action of the furnace; this again softens the glass, which is kept continually revolving by turning the pointil on an iron rest or hook fixed to the masonry of the furnace. The revolutions are at first slow, but are gradually accelerated as the softening of the glass goes on, and the centrifugal force so produced throws the edges of the orifice outwards, as in *e*, fig. 11. As the glass flattens, it is revolved with greater rapidity, and advanced so near to the mouth of the nose-hole as to draw the flames outward, by contracting the draught. This completes the softening of the glass, which is done suddenly, with a rushing noise like the unfurling of a flag in the wind, caused by the rapid flying outward of the softened glass and the rush of the flames outwards. It becomes perfectly flat, and of equal thickness, except at the bullion or centre, formed, as before described, by the bullion-bar and the punty. The *flashing* is now complete; and the workman removes it from the nose-hole, and still continuing to turn it in his hands, in order to cool and harden it, as he walks along, carries it to the annealing oven, where another one receives it on a large flattened fork-like implement at the moment the *flasher*, who has hold of the pointil, suddenly detaches it by a touch of his shears. It is then passed through the long horizontal slit which forms the opening into the annealing oven, and when fairly in, it is dexterously turned on

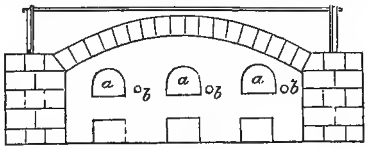


Fig. 10.

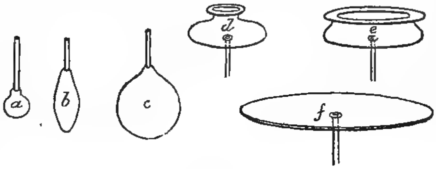


Fig. 11.

its edge; here it remains at a temperature somewhat below that required to soften glass, until the oven is filled with these so-called *tables* of glass, when the heat is suffered to decline, until the whole is cold, when they are removed to the packing-room, to be packed in crates for sale.

Until lately, crown-glass was almost universally employed for windows, but now that which is called *German sheet* has become quite as common, besides which *British sheet*, which is the same glass polished, and *plate-glass* are much used. The operation of making the sheet-glass is very different from that employed in making crown-glass, inasmuch as a long and perfect cylinder is sought to be produced by the *blower* instead of a sphere of glass. This necessitates also a different arrangement of the glass-house, as is seen by the ground-plan shewn in fig. 12: *aa* is the furnace, *b* is the annealing oven, heated by the flue *b′*, which opens into the main furnace; the *leer*, or annealing oven, is often, however, an independent structure; *c, c, c, c, c, c, c, c*, are the eight pots, which is the number usually employed in these works. These, of course, are opposite to the openings for working them, and in front of each opening is a long opening in the ground, about eight feet deep and three feet in width; *d, d, d, d, d, d, d, d*. The workman stands on the edge of this pit, and having made his gathering, as in the crown-glass manufacture (*a*, fig. 13), he next *mavers* it, without, however, using the bullion-rod (*b*, fig. 13). He next proceeds to blow his glass, holding it downward whilst doing so, that its weight may widen and elongate the bulb, and from time to time dexterously swings it round, which greatly increases its length (*c, d*, fig. 13). As it cools rapidly in this operation, he from time to time places his pipe in the rest which is fixed before the furnace-mouth, and gently turning it round, he brings it again nearly to the melting-point, then he repeats the blowing and swinging, standing over the pit, to enable him to swing it completely round as it lengthens out. These operations are continued until the cylinder has reached its maximum size, that is, until it is of equal thickness throughout, and sufficiently long and broad to admit of sheets of the required size being made from it (*e*, fig. 13). Sometimes these cylinders are made 60 inches in length, allowing sheets of glass 49 inches in length to be made from them. The next operation is to place the pipe in the rest, and apply the thumb so as to close the opening at the blowing end; the heat of the furnace soon softens the glass at the closed extremity of the cylinder, and as the enclosed air is prevented escaping, as it rarefies, by the thumb placed on the opening of the blow-pipe, it bursts at the softened part (fig. 13, *f*); the operator then quickly turns the cylinder, still with its end to the fire, and the softened edges of the opening, which at first are curved inwards, are *flashed* out until they are in a straight line with the sides of the cylinder (*g*, fig. 13). It is then removed, and placed on a rest or casher-box, when a small punty of melted glass at the end of a pointil is brought by a boy; this the workman applies to one side of the cylinder, just below the shoulder formed at the blow-pipe end (fig. 13, *g*), and drawing it out to a thin string, wraps it quickly so as to draw a line round the cylinder; after a second or two, he withdraws this line of red-hot glass, and touching it quickly with his cold shears, the shoulder and neck drop off as neatly as if cut with a diamond.

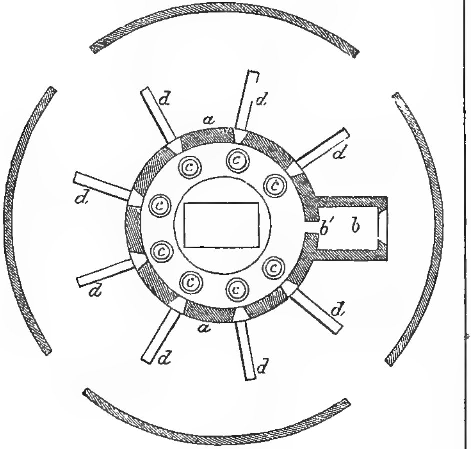


Fig. 12.

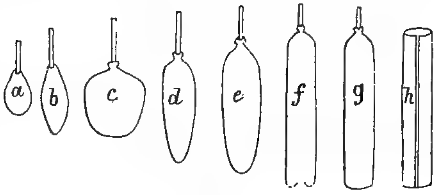


Fig. 13.

The cylinder (fig. 13, *h*) is now placed for a short time in the annealing oven (*b*, fig. 12), where it is prepared for cutting; it is next placed in a groove lined with green baize, and a diamond fixed to a sliding rule makes a perfectly straight cut from end to end. The split cylinder is then taken to the *flattening* arch or furnace, where it is laid on the bottom, with the diamond-cut upwards. The bottom is a perfectly smooth stone, kept constantly free from dust by the workman; here the heat is sufficient to soften without melting the glass, and the *flattener*, as it softens, opens the two edges of the crack until they fall outward flat on the stone; he then takes an implement in the form of a rake, made by placing a piece of charred wood transversely at the end of a long handle, and this is gently rubbed over the glass, producing a very smooth surface. At the back of the flattening arch is an annealing oven, communicating with the arch by a narrow horizontal slit, through which the sheet of glass is now pushed on to a plate of iron, which receives it; and as this plate is one of a series linked together so as to form an endless band, which can be turned round, the sheets move forward into the annealing oven, where the workman gently lifts them on edge until the oven is filled, when, as in the case of crown-glass, the heat is allowed to decline until perfectly cool, the sheets are then ready for use. Very much larger sheets are obtained by this process than by the former one, hence it is becoming of great importance; but it is not easy to obtain workmen sufficiently powerful and dexterous to blow and twirl the largest-sized cylinders; at present, we obtain almost all the operatives so employed from Belgium.

Glass-shades are made in the same manner as above described; indeed, they are nothing more than the rounded ends of the cylinders before being burst. When wanted oval or square, these forms are produced by boxes of wood charred inside, of the size the shades are required, through which the cylinder is passed when being blown, until the soft glass touches, and receives shapes from the inside of the box or mould: they are afterwards annealed, and cut to the lengths required. If of large diameter, they require immense strength and great skill in the operator, who sometimes aids the power of his breath by taking into his mouth a little spirit, which he blows down the pipe; this, of course, is instantly converted into vapour, when it reaches the red-hot cylinder, and by its expansion aids in distending the glass.

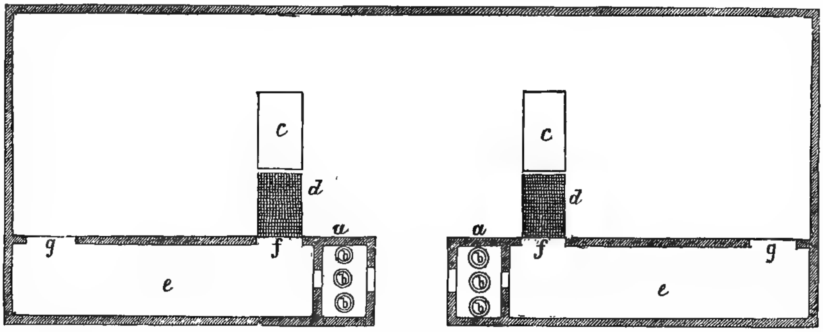


Fig 14.

Plate-glass is made in a totally different manner; and as its value depends chiefly on its purity, the greatest possible care is taken to procure materials of the best quality, and almost every manufacturer has his own private formula for the mixture. It may, however, be said to consist chiefly of sand and alkaline salts, as in other kinds of glass, and the following is one receipt known to be in use: Fine white sand well washed, to free it from impurities, 720 lbs.; sulphate of soda, 450 lbs.; slaked lime, 80 lbs.; nitrate of potash, 25 lbs.; and cullet of plate-glass, 425 lbs. These ingredients, when melted and skimmed, should yield about 1200 lbs. of perfectly clear metal, which is the quantity usually required for a casting. When melted and ready for use, the pot is lifted out of the furnace (*aa*, fig. 14) by means of the forceps, and wheeled up to the casting-table (*cc*, fig. 14); here it is seized by a crane and tackle, by which it is lifted, and so nicely poised over the table, that it can be easily tilted so as to pour out its contents. All this requires so much care and steadiness, that the men, impressed with the great danger of carelessness, usually preserve perfect silence during their work. The table is of large size —20 feet or more in length, by 8 or 10 feet in width. When the red-hot liquid glass is poured on, it immediately begins to spread; two bars of iron, a little thicker than the plate is intended to be, are quickly laid on each side of the table, and a steel roller is laid across, resting on these bars: this roller is worked by hand, and rapidly spreads the glass all over the table, the bars preventing it from running over the sides, and regulating its thickness. In a very short time, it begins to cool; the men then seize the end of it with pincers, and pull it forward with great dexterity on to an endless band of wire-gauze, which, being made to revolve, moves the immense plate forward to a slit-like opening to the annealing oven (fig. 14, *ff*), where it is worked on to another table on wheels, which is pushed forward to make room for another. The annealing oven is usually of immense length, as, in the case of plate-glass, the sheets cannot be set on edge. At the works at St Helen's, in Lancashire, where glass of all kinds is extensively made, there are usually two annealing ovens to each shed, the furnaces being placed between them; each oven runs to the end of the shed, and these sheds are usually over 300 feet in length. The ground-plan shewn in fig. 14 will give a general idea of the arrangement of one of these vast work-shops. The main building is a shed, with the doors at each end, and both doors and windows are made so as to exclude drafts of air, which, if admitted during the operation of casting, are highly injurious to the quality of the manufacture. *a, a*, are the two melting-furnaces; *b, b, b, b, b, b*, the pots; *c, c*, the casting-tables; *d, d*, the endless bands of wire-gauze for moving the plates to the annealing ovens; *e, e*, where they enter by the narrow openings, *ff*; and, after they have sufficiently cooled, are removed through the openings at each end, *g, g*.

The plates are next removed to the first polishing-shed, where each is imbedded in a matrix of stucco, leaving one surface exposed; the whole is enclosed in a frame, which holds both glass and stucco securely. Two of these frames are placed one over the other, with the two exposed surfaces of glass in contact. The lower frame is fixed, and the upper is made to move by machinery with great rapidity backward and forward with a swinging motion, so as to describe an opposite curve with each backward and forward motion. Sand and water are continually thrown on the surface of the fixed plate, and thus the first stage of polishing is performed. The plates are then readjusted in the frames, and the other surfaces are brought upwards, and receive a similar rubbing down with sand and water. The plates are next removed to the second polishing-room, where women are usually employed; here they are again fixed on low tables, and each woman rubs the surface for a long time with a piece of plate-glass, covering from time to time the whole face of the plate with emery-powder and water. After both sides have received this hand-polishing, the plates are removed to a third room, where they are again imbedded on tables which are movable by machinery, so that the whole surface of the plate may be brought under the action of the polishers. These are large movable blocks, covered with woollen cloth and leather, and loaded so as to press on the glass; the polishing material used is colcothar, the red oxide of iron; this completes the polish which gives so much beauty to plate-glass. It is a long and laborious process, and is the chief cause of the high price of plate as compared with other sheet-glass. British plate is only the cylinder glass polished by the processes just described; its comparative cheapness is due to the rapidity with which the cylinder can be blown. Of this rapidity, the best estimate may be formed from a single well-authenticated statement concerning the first Crystal Palace, which had 18 acres of roof; when the sides are added to this, and a fair addition for the increase caused by the ridge-and-furrow system of the roof, the whole extent may be stated at 25 acres; and yet this vast surface of glass was supplied by Messrs Chance & Co. of Birmingham, with only an interruption of three weeks to their ordinary business.

Flint-glass and Optical Glass.—The general principle of the manufacture of these two varieties of glass is identical with those already described, the chief difference consisting in the great care taken to insure perfect purity in the materials. The pots used are so made, that the metal is protected from the chance of being contaminated by any accidental impurities falling in or from the gases of the furnace; they are made with a dome-shaped roof and a lateral arch-shaped opening (fig. 7), which is placed opposite the furnace-mouth, so that the workman has easy access to the contents of the pot, which is necessarily smaller, otherwise the workman could not dip to the bottom.

The materials used for the best *flint-glass* are varied in their proportions, according to the judgment of the manufacturer; they consist of the whitest sand which can be procured, fine American pearl-ashes (impure carbonate of potash, which is purified by dissolving out the carbonate from its impurities, and evaporating it to dryness in leaden evaporating pans), red lead, or else litharge (the semi-vitrified protoxide of lead), and a small quantity of nitre (nitrate of potash). To these, according to their greater or less purity, the manipulator adds more or less of oxide of manganese and arsenic, as correctives; the former removes the green discoloration which the presence of even a small quantity of iron in the sand will produce; and the latter corrects the tendency the manganese has to give a purple tint to the glass. Both substances require the utmost care and judgment in their use, otherwise they are more injurious than beneficial. The following are the usual proportions: Sand, 51; pearl-ashes, prepared, 16; litharge, 28 (or red lead, 29); nitre, 4$\frac{3}{4}$; white arsenic, $\frac{1}{8}$; peroxide of manganese, $\frac{1}{8}$; cullet of flint-glass in any proportion the manufacturer thinks proper.

Formerly, the silica was obtained by calcining flints, hence the name applied to this kind of glass, but now sand is used instead; and although beautifully white sands are obtained from Lynn, in Norfolk, from the Isle of Wight and other parts of Hampshire, from Aylesbury, from France, and even from North America and Australia, it nevertheless requires most careful preparation by washing, calcining, and sifting.

But however carefully flint-glass is made, and however pure and transparent the crystal may be which is so made, it nevertheless possesses some defects, which interfere with its fitness for telescopes, microscopes, light-houses, and other optical purposes. These defects consist in almost imperceptible striæ in the material, which produce certain optical aberrations. These striæ are known to be caused by the imperfect mixture of the materials, and the want, consequently, of a uniform density. This has been obviated by M. Guinaud and his associate, M. Frauenhofer, by stirring the metal in the pot with an iron rod; but greater improvements have been effected by our own chemist Faraday, who not only improved upon the manipulation of Messrs Guinaud and Frauenhofer, but suggested also an improvement in the materials, by the addition of carbonate of baryta and a little carbonate of lime, which produces a glass of the greatest density and clearness that has ever been known before. Instead of the iron rod for stirring, which of itself is apt to discolour the glass, an iron rod coated with platina is used. In the manufacture of this particular kind of glass, the Messrs Chance of Birmingham are unrivalled, and they have produced very perfect discs for lenses, weighing as much as two hundredweights each.

Flint-glass is employed in the manufacture of all the articles of utility and ornament for table and other domestic uses; and as the manufacture of each article requires different management, it would be impossible here to give any satisfactory explanation of the manipulative processes. Suffice it to say, that at present Great Britain is unrivalled in the production of so-called crystal or flint-glass, which we manufacture of the greatest purity and brilliancy; but in the coloured kinds the Bohemians take the lead, and excel both in design and in the art of colouring.

Much flint-glass is now *moulded* into drinking-vessels, bottles, and other common articles; but these are always greatly inferior to those which are made by the handicraft of the regular glass-blower.

Coloured glass is a general term which includes several distinct varieties: first may be mentioned the glass made for windows and other similar purposes. Coloured sheet-glass is made both by the crown-glass and cylinder-glass processes. Sometimes it is of *pot-metal*—that is, the glass and the colouring materials are all melted and worked from one pot—generally, however, this glass is of too dark a colour, and the kind called *flashed glass* is most generally used; in this, two pots are employed, one containing the coloured glass, as if for pot-metal, the other colourless glass. The workman makes his first gatherings from the colourless glass, and the last only from the coloured pot; the consequence is that the glass when finished, although it cannot be perceived, has only a thin skin of the coloured material on one side, and the colour is thus as it were diluted. This has other advantages, because, by skilful grinding, the colour may be removed, and transparent patterns produced on the coloured ground; and the same may be done, and even delicate shading of the colour effected, by eating away the coloured side more or less by means of *fluoric acid*, which is frequently employed, and most beautiful effects are produced.

The colours usually employed consist of metallic oxides, other substances are, however, occasionally used. *Gold*, in the state called *Purple of Cassius*, invented by Dr Andrew Cassius of Leyden in 1632, and also in the state of a simple solution, without tin, yields the most beautiful ruby, crimson, rose, and purple colours. *Copper*, as a sub-oxide, yields a fine ruby red, and the black oxide gives an emerald green. *Cobalt* yields the rich deep blues. *Iron*, as a protoxide, gives a dull green; combined with alumina, it gives flesh colour, or pale rose, and combined with chloride of silver, it yields an orange yellow; as a peroxide, it gives a common red and a brownish red. *Silver*, with alumina, also yields a yellow colour of great beauty; and commoner and less beautiful yellow tints are produced by glass of antimony, and even by carbon, either in the form of soot or charcoal. *Uranium* gives the beautiful chrysoprase green and canary yellow, with a slight degree of opalescence; it also gives an emerald green. Arsenic, or arsenious acid, produces an opaque white. Manganese gives a purple or amethystine colour as an oxide; and as a peroxide, with a little cobalt, a fine garnet-red colour. These are some of the materials generally employed, but there are numerous others, the use of which depends upon the skill of the manufacturer.

The applications of coloured glass to ornamental purposes are very numerous; one has already been fully described under the head of GEMS, ARTIFICIAL. In the hands of skilful glass-workers, especially those of Bohemia, articles of ornament and utility, combining the most exquisite combinations of form and colour, are produced. But not the least interesting application of coloured glass is the art of producing windows exhibiting beautiful pictorial designs. So beautiful are the designs of some of the windows formed from this material, that they deservedly rank as works of high art. This art originated at the commencement of the 9th c., and received its greatest development in the 15th century. It then began to decline, until, at the commencement of the present century, it was slowly revived, at first with but little success, a conviction having been formed that the true secrets of the art of producing the rich colours seen in ancient windows were lost. Gradually, chemistry and the microscope removed the errors, the former demonstrating the exact constituents of the best kinds of ancient glass, enabled the manufacturer to imitate it exactly. Still, however, with the same ingredients, there was a remarkable want of richness in the modern material: the cause of this was revealed by the microscope, which shewed that it was due to minute pores, which are produced by weathering of the outer surface, the alkaline parts of the glass being washed out, as it were, by the rain, &c. This porosity, by breaking up the surface, destroyed the flatness and glare of the glass, and by mixing more thoroughly the rays of light, produced that richness for which the ancient glass is so famous. Various methods were adopted to produce this effect: one which became common was, to stipple the surface with dots of a dark opaque colour; now it is still better and more ingeniously done by sprinkling sand thickly over the gathering of glass before receiving the coloured coat, so that when blown and flashed, it has the grains of sand thinly scattered through its substance, and these being refractive, very successfully produce a richness nearly equal to that acquired by age.

So far, indeed, from the art being lost, there is no doubt that a better material and better colours are now made; and those who examine the works produced by Ballantyne, Chance, and other manufacturers of our country, and those of Munich and other continental works, will not easily believe that the ancients were more successful in their designs than the moderns. But besides the pot-metal and flashed glasses before mentioned, there are two other methods of colouring and producing pictorial effects on glass. The first is by staining, that is to say, painting the glass with various materials, usually metallic oxides finely powdered, and mixed with oil of spike or some other volatile medium; the glass is then placed in a furnace, in which it is made red hot, and a deep stain of the colour required is produced on the glass. This process enables the artist to produce a complete picture on one piece of glass; whereas, by the older method, the picture had to be made up of a vast number of pieces set in a slender lead-framing. Generally, both methods are employed in pictorial windows, as the staining enables the artist to give the human features. But staining does not produce the same brilliancy of colour, and lessens the transparency of the glass, hence it is in less esteem.

Another mode of decorating glass is by using the opaque or nearly opaque enamel colours, and after the design is produced with these, to fix them by firing: this is a beautiful art, and is variously employed.

Lately, another and very remarkable invention for decorating glass has been patented by M. Joubert of Bayswater, London—viz., the fixing of photographic pictures upon this material. The sensitive salt used to receive the picture is one which will stain glass; therefore, on firing, the picture is deeply burned into the glass, and cannot be effaced; most beautiful effects are thus produced; natural landscapes and pictures may be transferred with most perfect fidelity.

Glass-grinding and Engraving.—Glass can be easily ground with sand and water, so that the ornamental effect of vessels and other objects of flint-glass may be very greatly enhanced. Sand, however, leaves a rough surface, and destroys the transparency; but this is easily restored by other polishing materials, as emery, putty-powder (oxide of tin), tripoli, red oxide of iron, or colcothar, &c. The cutting and polishing are effected with wheels or discs of sandstone, wood, and metal. Very fine engraving is done with pointed metal tools and diamond-dust, the same as in seal-engraving, &c.

The polishing of lenses for optical instruments and for light-houses is an art of very great importance, requiring extraordinary skill. Much of the polishing of the larger lenses is effected by the aid of machinery, and perhaps no combinations of mechanical art are more wonderful than the machines by which the Messrs Chance of Birmingham polish the prisms and lenses for catoptric and dioptric light-houses.

Glass in a liquid form has lately been extensively made under the name of soluble glass or silicate of soda; it is silica, or sand, dissolved in a solution of caustic soda. This liquid, when used as a varnish, is said to protect stone and other materials from the injurious action of the weather, and for this purpose is now employed to arrest the decay of the stone of the new Houses of Parliament. It is also extensively used in the manufacture of soap (see SOAP); and this, or a similar soluble glass made with potash, has been recommended to be used as a dressing for muslins and other fabrics to render them fireproof. The soluble soda-glass has also been successfully employed in mounting microscopic objects, instead of Canada balsam or glycerine.

GLASS-PAINTING (in Art). The application of coloured glass to the artistic decoration of windows has been previously alluded to, but the very high position which it formerly attained, and which it is again rapidly approaching, renders it necessary to devote a short space to its relationship to the fine arts.

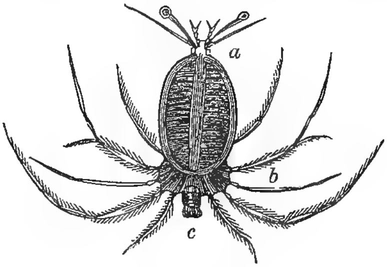
Originally, there was but one method of making ornamental glass windows, and that was to produce the pattern in outline with finely made leaden frames, into the grooves of which pieces of coloured glass or of stained glass were fitted. Modern chemistry has, however, so improved the art of glass-staining, that large pictures may now be produced on single sheets of glass, as in the case of the windows shewn by the St Helen's Crown Glass Company in the Exhibition of 1851, one of which, designed by Mr Frank Howard, representing 'St Michael Casting out the Great Dragon,' was upwards of nine feet high by three feet broad. It was on plate-glass, and had to be *fired* or submitted to intense heat fifteen times, notwithstanding which it was perfectly smooth, and although somewhat deficient in brilliancy of colour, was an excellent and effective composition.

One of the best known of the early applications of glass to the window decoration is that in the monastery of Tegernsee, in Upper Bavaria, which was secularised in 1802, and is now a private residence; but these windows (executed in the latter half of the 10th c.), like all of the first attempts, were only tasteful arrangements of coloured glass in imitation of the stone mosaics used for floors, &c. Nor did the art rise much above this for at least three centuries after its origination; but in the 13th c., owing to the full development of the Gothic style of architecture, it became of immense importance, coloured glass taking the place of tapestried curtains in filling up the spaces within the groined arches. The mosaic patterns were superseded by elaborate designs, not only in beautiful arabesque and other styles of decorative art, but even pictorial compositions were attempted; and to such perfection did this arise, that many of the works produced in the 15th c. are marvels of art. In all of these, the figures, with the exception of the faces, were made up of pieces of self-coloured glass combined with great skill and taste; the features were painted in enamel colours, and burned in, and the art of the artist was shewn by giving ease and grace to the figures corresponding to the expression of the faces. Gradually the art of shading, by removing certain portions of the coloured surface, and other improvements were effected. This was the culminating point in the history of the first period of the art of glass-painting, as it is called, and seemed to have attained the highest perfection of which it is susceptible, for the efforts which followed to improve it by assimilating it to oil-painting signally failed, and with this failure began that decline in the art which was perhaps more remarkable in the instance of glass-painting than in any other, for in a comparatively short time it began to be felt that the true art was lost. Since the commencement of the present century, rapid strides have been made towards improvement; and the renaissance bids fair to eclipse the glory of the first epoch. The great seats of this art are now in Munich, Nürnberg, Paris, Birmingham, Edinburgh, and one or two more places; and it never received more liberal patronage in its palmiest days than it now does.

GLASS PAPER, or **CLOTH**, is made by powdering glass more or less finely, and sprinkling it over paper or calico still wet with a coat of thin glue: the powdered glass adheres as it dries. Glass paper is very extensively employed as a means for polishing metal and wood-work; it is sold in sheets, and is very largely manufactured at Birmingham and other places.

GLA'SSCHORD, a musical instrument, with keys like a pianoforte, but with bars of glass instead of strings of wire. It was invented in Paris in 1785 by a German called Beyer. The name glasschord was given to the instrument by Franklin. When the glasschord was completed, it was exhibited publicly in Paris, and performed on by the inventor; but it never was received with favour by the instrument-makers, so that no more were ever made, as possibly its construction and mechanism remained a secret with its inventor.

GLASS-CRABS (*Phyllosomata*), a family of crustaceans, of the division *Malacostraca*, order *Stomapoda* of Cuvier, remarkable for the transparency of their bodies, whence their popular name, whilst the scientific name (Gr. leaf-body) refers to the great horizontal expansion of the carapace. They have little resemblance to crabs. The head is represented by a large oval plate, bearing eyes mounted on very long stalks; a second plate, the breadth of which much exceeds its length, represents the thorax, and bears the feet, most of which are long, and some of them, as in a few other crustaceans, bifid, with one branch much longer than the other. The abdomen is small. Milne-Edwards supposes these creatures to have no special organs of respiration, but that the blood is aërated through the general surface of the body. They are found in tropical and sub-tropical seas; and so transparent are they, that, when floating on the surface of the water, they would not be perceived but for the beautiful blue of their eyes.

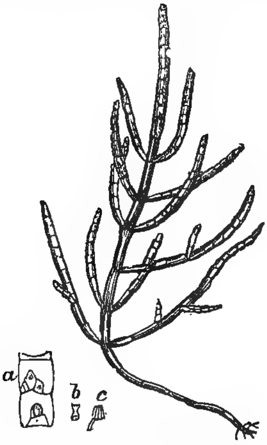


Glass Crab:
a, head; *b*, thorax; *c*, abdomen.

GLA'SSITES, a religious sect, which sprung up in Scotland about 1730, when its founder, John Glass, a native of Auchtermuchty, in Fife, and minister of the parish of Tealing, near Dundee, was deposed by the General Assembly of the Church of Scotland, chiefly on account of views which he had adopted and published concerning the nature of the kingdom of Christ. In his *Testimony of the King of Martyrs concerning his Kingdom*, founded on the words of our Saviour recorded in John xviii. 36, 37, Mr Glass maintained that all national establishments of religion are inconsistent with the true nature of the church of Christ, and was thus probably the first assertor of the *Voluntary* principle in Scotland. He also advocated a system of church-government essentially *Independent* or *Congregational*. After his deposition by the General Assembly, he became the pastor of a congregation. He died at Dundee in 1773. His personal worth and piety were acknowledged even by the most strenuous opponents of his peculiar opinions. A number of small congregations or *churches* were soon formed on *Glassite* principles, not only in Scotland, but in England and America; but both in England and America, the name of a follower of Glass, Robert Sandeman, prevailed over his own, and the sect received the name of *Sandemanians*. Sandeman, a native of Perth, is chiefly known from his advocacy of certain views respecting the nature of saving faith, now commonly designated *Sandemanian*, essentially consisting in representing faith as 'a bare belief of the bare truth,' which belief, however, both Glass and Sandeman, with at least their immediate adherents, regarded as the fruit of Divine grace and the work of the Holy Spirit. The G. have, since the beginning of the 19th c., decreased in numbers. In 1851, there were only six Glassite churches in Scotland, none of which contained very many members; and at the same date only six Sandemanian churches existed in England. The G. maintain the necessity of a plurality of teaching *elders* in every church, but do not require any special education for this office or separation from secular employments; they hold a second marriage a disqualification for it; they deem it unlawful to join in prayer with any one who is not a brother or sister in Christ; they observe the Lord's Supper weekly; they maintain *love-feasts* or dinners between morning and afternoon services, at which it is incumbent on every member of the church to be present; they are rigid in abstaining from things strangled and from blood; and in general hold by the most literal interpretation of other Scripture rules, as concerning the kiss of charity, and the washing of the feet of fellow-disciples; they disapprove of games of chance, and of all use of the lot except for sacred purposes. Their charity, both to their own poor and to the poor of other denominations, is said to be exemplary.

GLASS-MEN were wandering rogues or vagrants, under the statutes 39 Elizabeth c. 4, and 1 James I. c. 7.

GLA'SSWORT (*Salicornia*), a genus of plants of the natural order *Chenopodiaceæ*, having uniform hermaphrodite flowers, with a single fleshy obscurely lobed perianth imbedded in an excavation of the *rachis*, one stamen or two, and a short style, the fruit a *utricle* enclosed in the enlarged perianth. One species (*S. herbacea*), a leafless plant with jointed stems, is common in salt marshes in Britain. It makes a good pickle, and is sometimes sold for this purpose. Several species grow abundantly on the shores of the Mediterranean; and as they contain a large quantity of soda, are used in making *barilla*, along with the species of Saltwort (q. v.).



Glasswort (*Salicornia herbacea*):
a, joints of stem bearing flowers; *b*, style; *c*, stamen.

GLA'STONBURY, an ancient municipal burgh and market-town in the county of Somerset, 25 miles south-west of Bath, is built in the form of a cross, and occupies a peninsula formed by the river Brue, or Brent, called the Isle of Avalon. It has small manufactures of silk, and some export trade in timber, slates, tiles, and agricultural produce, by means of a canal connecting it with the Bristol Channel, and the railway between the Bristol and Exeter and Wilts and Somerset lines which passes through Glastonbury. Pop. (1861) 3593. The town owes its origin to its celebrated abbey, which, according to tradition, was founded in 60 A. D., and was one of the earliest seats of Christianity in Britain. Its traditionary founder was Joseph of Arimathea, and the 'miraculous thorn,' which flowered on Christmas-day, was, till the time of the Puritans, believed by the common people to be the veritable staff with which Joseph aided his steps from the Holy Land. The tree was destroyed during the civil wars, but grafts from it still flourish in the neighbouring gardens. In 605 A. D. the monks adopted the dress and rules of the Benedictine order. This magnificent pile at one time covered 60 acres; but as most of the houses in G., and also a causeway across Sedgemoor, have been constructed of the materials, the extent of the ruins is now much diminished. The most interesting remains are the Abbey Church, with St Joseph's Chapel, St Mary's Chapel, and the Abbot's Kitchen. St Joseph's Chapel is one of the most elegant specimens in existence of the transition from Norman to Early English architecture, and is supposed to have been erected during the reigns of Henry II. and Richard I. It is now roofless, and the vaulting of the crypt is nearly destroyed. The entrance is adorned with sculpture. Below the floor is a Norman crypt, within which is St Joseph's Well. Of the Abbey Church, few fragments remain. The Chapel of St Mary is roofless, but the remains of its pointed windows and archways are exceedingly elegant. The Abbot's Kitchen, now separate from the rest of the ruins, is a square massive structure, the walls strongly buttressed, and dates from about the 15th century. G. has the honour of ranking St Patrick (415 A. D.) and St Dunstan among its abbots. In 1539, Henry VIII. summoned Abbot Whiting to surrender G. and all its treasures; and on his refusal, condemned him to be hanged and quartered, and the monastery confiscated to the king's use, which sentence was immediately carried into execution. According to tradition, King Arthur and his Queen Guinevere were buried in the cemetery of the abbey; and Giraldus Cambrensis states that 'a leaden cross, bearing the following inscription, "Hic jacet sepultus inclytus Rex Arthurus in insula Avallonia," was found under a stone seven feet below the surface; and nine feet below this was found an oaken coffin, containing dust and bones.' This disinterment took place by order of Henry II. The only other objects of interest at G. are the Church of St Benedict; the Church of St John the Baptist, with a tower of 140 feet high; the Weary-all Hill, where Joseph of Arimathea rested from his weary pilgrimage; and the Tor Hill, where the last abbot of G. was put to death, 500 feet above the sea-level, crowned by a beautiful tower, the ruin of a pilgrimage chapel of St Michael.

GLATZ, a town of Prussia, in the province of Silesia, is a fortress of the second rank, and is situated between two fortified hills, on the left bank of the Neisse, 52 miles south-south-west of Breslau. It has four Catholic churches and a Catholic gymnasium; and carries on considerable manufactures of linen, damask, and woollen fabrics, as well as of leather and rose-garlands. Pop. 10,949, including 2176 of a garrison. During the Thirty Years' and the Seven Years' Wars, G. was frequently besieged and taken.

GLAUBER, JOHANN RUDOLPH, a German chemist and physician, was born at Karlstadt, in Franconia, in 1604, and died at Amsterdam in 1668. No details regarding his life are known, except that he resided for a long time at Salzburg, then at Kissingen, then at Frankfort-on-the-Maine, then at Cologne, from whence he probably removed to Amsterdam. Although a believer in the philosopher's stone and in the universal medicine, he contributed very materially to the progress of chemistry. Poggendorff (in his *Biographisch-literarische Handwörterbuch*) gives a list of about thirty of his works, of which a collected edition up to the date of publication appeared, in two quarto volumes, in 1658—1659, at Frankfurt, and another edition, in seven octavo volumes, in 1661, at Amsterdam. An English translation by Packe, in one large folio volume, was published in London in 1689. His name at the present day is chiefly known for his discovery of sulphate of soda, which he termed *sal mirabile*, and regarded as a universal medicine, and a cure for all diseases.—See Kopp's *Geschichte der Chemie*, vol. i. pp. 128—133.

GLAU'BER'S SALT (so called from Glauber, who discovered it in 1658) is the popular name of the neutral sulphate of soda, whose chemical composition is represented by the formula $NaO,SO_3 + 10aq$. It occurs in long four-sided translucent prisms, terminated by dihedral summits, and containing ten atoms of water. On exposure to the air, the crystals lose all their water, and become resolved into a white powder. When heated, they readily melt in their water of crystallisation; and if the heat is sufficiently continued, the whole of the water is expelled, and the anhydrous salt remains. Glauber's salt has a cooling, bitter, and saltish taste; it is readily soluble in water; its solubility (in the ordinary crystalline form) increasing up to 92°, when it appears to undergo a molecular change, and to be converted into the anhydrous salt, which at this temperature is less soluble than the hydrated compound, and separates in minute crystals. This and other anomalies which occur in the solubility of this salt have been carefully studied by Löwel (*Ann. de Chemie*, 3d ser. vol. ix. p. 50).

Glauber's salt is a constituent of many mineral waters, and occurs in small quantity in the blood and other animal fluids. It occurs, under the name of *Thênardite*, near Madrid, in the form of anhydrous octahedra deposited at the bottom of some saline lakes; and is found combined with sulphate of lime, as *Glauberite* ($NaO,CaO,2SO_3$), in the valley of the Ebro.

The anhydrous salt is prepared in enormous quantity from common salt and oil of vitriol, with the view of being afterwards converted into carbonate of soda. See SODA.

For medical use a purer form is required. The salt which remains after the distillation of hydrochloric acid—this salt being sulphate of soda contaminated with free sulphuric acid—is dissolved in water, to which is added powdered white marble (carbonate of lime), to neutralise the free acid, and to precipitate it as an insoluble sulphate; the solution is boiled down till a pellicle appears, is strained, and set aside to crystallise.

It is used as a common purgative, and is especially applicable in fevers and inflammatory affections, when it is necessary to evacuate the bowels without increasing or exciting febrile disturbance. The usual dose is from half an ounce to an ounce; but if it is previously dried, so as to expel the water of crystallisation, it becomes doubly efficient as a purgative. It is now much less frequently used in domestic medicine than formerly, having given place to milder aperients.

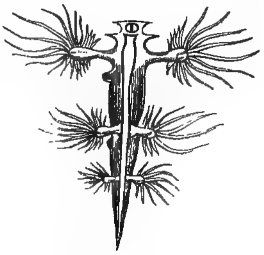
GLAUBER'S SPIRIT OF NITRE is one of the old terms for nitric acid.

GLAU'CHAU, a thriving manufacturing town of the kingdom of Saxony, is picturesquely situated on the right bank of the river Mulde, 8 miles north-north-east of Zwickau. Owing to the unevenness of its site, it is irregularly built; but its appearance is striking. It is the second in rank among the manufacturing towns of Saxony. Here and in the neighbourhood, the weaving of every kind of goods flourishes; there are also important dye-works, print-works, iron-foundries, and machine factories. Pop. 14,360.

GLAUCO'MA (Gr. *glaukos*, sea-green), an opacity of the vitreous humour of the eye, characterised by a bluish tint seen from without, and the absence of the peculiar characters of Cataract (q. v.), which, in some respects, it resembles as regards the gradual obscuration of vision. It is an almost incurable disease.

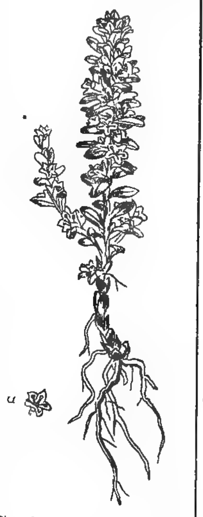
GLAUCONIE, a French term introduced by M. Brogniart as the name of several strata of different ages. The Glauconie Crayeuse and Sableuse are equivalent to the Upper and Lower Greensand, while the Glauconie Grossier is an Eocene deposit contemporaneous with the Bracklesham beds.

GLAU'CUS, a genus of molluscs, referred to the class *Gasteropoda*, but having no distinct respiratory organs. The body is long, slender, gelatinous, furnished with three pair of digitated finlike appendages, which were formerly supposed to be gills. The mouth has horny jaws, adapted for preying on other small marine animals. These small molluscs—about an inch and three-quarters long, of a blue colour, and extremely delicate and beautiful—inhabit the tropical parts of the Atlantic Ocean, and float inertly with irregular movements of the slender branches of their fins on the surface of the water.



Glaucus Atlanticus.

GLAUX, a genus of plants of the natural order *Primulaceæ*, having a 5-lobed calyx, no corolla, and a 5-valved capsule with about five seeds. G. *maritima*, sometimes called SEA MILKWORT and BLACK SALTWORT, is one of the most common plants of our sea-coasts, growing in almost every muddy situation. It is a small plant, with branching stems, often procumbent, and small fleshy leaves. It makes a good pickle.



Sea Milkwort (*Glaux maritima*): *a*, a flower.

GLAZE. See POTTERY.

GLEA'NING. In conformity with the positive command contained in the Mosaic law, to leave the gleanings of the harvest to the poor and to the stranger (Levit. xix. 9, and xxiii. 22), there has been almost everywhere a popular feeling to the effect that the farmer was not entitled to prevent the poor from gathering what the reaper had left behind. In England, the custom of gleaning had very nearly passed into a legal right, for there is an extra-judicial dictum of Lord Hale, in which he says that those who enter a field for this purpose are not guilty of trespass, and Blackstone (iii. 12) seems disposed to adopt his opinion; but the question has since been twice tried, and decided in the negative in the Court of Common Pleas, the court finding it to be a practice incompatible with the exclusive enjoyment of property, and productive of vagrancy and many mischievous consequences, 1 H. Bl. Rep. 51. It is still, however, the custom all over England to allow the poor to glean, at least after the harvest is carried. The privilege is one which, both from motives of humanity and of economy, ought certainly to be continued within proper limits, because it not only adds to the comfort and wellbeing of the poor, but by preserving from waste a portion of the fruits of the earth, and by employing children and infirm persons whose labour would not be available for any other purpose, it diminishes the expenditure for the support of the indigent, which already presses so heavily on the industrious portion of the community. It is a privilege, however, which is apt to be abused by able-bodied persons, who, by rising early in the morning, and going into fields from which the crop has only been partially carried, contrive to carry off grain to a greater value than the wages which they could have earned by honest harvest-work. With a view to checking this abuse, farmers in various districts have established rules for regulating the practice of gleaning. Some curious statistics on the subject of gleaning were published in the *Journal of the Statistical Society of London.* In Bohn's *Political Dictionary*, under the head 'Gleaning,' a statement is made shewing that the total gleanings of 388 families was £423, 12*s*., and the average for each family £1, 1*s*. 10*d*., which was one-fifth of the average harvest-wages of each of the same number of families.

In Scotland, it has been more than once decided that the poor possess no right to glean, at common law, and that the farmer may exclude them from his fields (Hutch. *Justice of the Peace*, ii. 47; Dunlop's *Paroch. Law*, 223).

GLEBE (Lat. *gleba*, a clod or lump of earth), the land possessed as part of an ecclesiastical benefice, or from which the revenues of the benefice arise. The assignment of glebe-lands was formerly held to be of such absolute necessity, that without them no church could be regularly consecrated. In England, the word manse includes both the parsonage-house and the glebe, whereas in Scotland it is applied exclusively to the house. The fee-simple of the glebe is held by the law of England to be in *abeyance*, from the French *bayer*, to expect—that is to say, it is only 'in the remembrance, expectation, and intendment of the law;' but after induction, the freehold of the glebe is in the parson, and he possesses most of the powers of a proprietor, with the exception of the power of alienation. Previous to the Reformation, the clergy possessed certain powers of alienation at common law; and if a bishop, with the assent of his chapter, or an abbot, with the assent of his convent, or the like, alienated glebe-lands, the deed would not have been void, because the fee-simple was in the holder of the benefice for the time being; but by 1 Eliz. c. 19, and 13 Eliz. c. 10, all gifts, grants, feoffments, conveyances, or other estates, shall be utterly void and of none effect, notwithstanding any consent or confirmation whatsoever. Neither could the incumbent exchange the lands or any portion of them without the authority of an act of parliament. This restriction was done away by 55 Geo. III. c. 147, for enabling spiritual persons to exchange parsonage or glebe houses or glebe-lands for others of greater value or more conveniently situated for their residence and occupation. By 5 and 6 Vict. c. 54, it is now provided that the commissioners appointed to carry into effect the commutation of tithes shall have power to ascertain and define the boundaries of the glebe-lands of any benefice, and also power, with consent of the ordinary and patron, to exchange the glebe-lands for other lands within the same or any adjoining parish, or otherwise conveniently situated. The subsequent act 17 and 18 Vict. c. 84 moreover provides that the incumbent of any benefice entitled to glebe, shall, with such consents as are specified in the act, be entitled to annex such glebe or other lands by deed to any church or chapel within the parish, district, or place wherein such glebe or land is situate. In addition to his glebe-lands, the rector or vicar is also seized in the edifice of the church itself (see CHURCH). It was long ago provided (28 Henry VIII. c. 11, s. 6), that if an incumbent died after having manured and sown the glebe-lands, he might make his testament of the profits of the corn; but if his successor be inducted before the severance thereof from the ground, he shall have the tithe; for although the executor represent the person of the testator, yet he cannot represent him as parson.

Glebe, in Scotland.—In Scotland, as in England, a glebe forms, as a general rule, a portion of every ecclesiastical benefice of the Established Church, and is thus an addition to the stipend, and sometimes a very important one. Ministers in royal burghs, however, cannot claim glebes, unless in the case in which there is a landward district attached to the parish. Even then, if there are two ministers, only the first can claim a glebe. Where parishes are disjoined, or separated into two portions, moreover, it does not necessarily follow that the portion erected into a new parish shall contain a glebe. By 5 Geo. IV. c. 72, provision is made for payment of compensation out of the public revenue, in lieu of manse and glebe, to ministers whose stipends do not exceed £200. If there are arable lands, the glebe must not be less than four acres. If there is no arable land, the minister is entitled to sixteen *soums* of grass adjacent to the church. A soum is as much as will pasture ten sheep or one cow, so that the actual extent varies with the richness of the soil and consequent quality of the pasture. The presbytery possesses the power of designing glebes, the heritor from whose property the glebe is designed having recourse against the other heritors of the parish. By 1572, c. 48, it is enacted that the glebe shall not be alienated by the incumbent. As the act limits its prohibition to such alienation as may be detrimental to the successor of the incumbent, it has been doubted whether the latter might not feu. The court, however, has been very unwilling to sanction this proceeding; and from the fact that land tends steadily to increase, whereas money diminishes in value, it seems of very doubtful propriety even where the arrangement is very advantageous at the time. When the church is changed, or transported, as it is called, to a new site, the court will authorise the sale or excambion of the glebe, but such excambions must be sanctioned by the presbytery. Where minerals are found on the glebe, they are worked under the superintendence of the heritors and presbytery for the behoof of the incumbent. Trees growing on the glebe are thought to belong to him. See TEIND COURT.

GLEE, the English name of a vocal composition for three or more voices, and in one or more movements. The style of music of the glee is peculiar to England, and quite different from the part-songs of Germany.

GLEET. See GONORRHŒA.

GLEIG, the REV. GEORGE ROBERT, M.A., a popular author and divine, son of the Right Rev. George Gleig, LL.D., Bishop of Brechin, and Primus of the Scots Episcopal Church, was born at Stirling, in Scotland, in 1796. In 1812, while a student at the university of Oxford, he joined as a volunteer a regiment then marching through that city on its way to Lisbon. Soon obtaining a commission in the 85th Regiment of light infantry, he served in the Peninsula. During the American war in 1812—1814, he was engaged in the campaign of Washington, at the capture of which city, in August 1814, he was severely wounded. In 1821 he published an account of the *Campaigns of Washington and New Orleans*, 8vo. At the close of the war, he retired on half-pay. He now completed his studies at Oxford, entered into holy orders, and in 1822 was presented by the Archbishop of Canterbury to the living of Ivy Church, Kent. In 1825, he published *The Subaltern*, a novel founded on his experience in the Peninsular War. In 1844, he was appointed chaplain of Chelsea Hospital, and in 1846, Chaplain-general of the Forces. Having devised a scheme for the education of soldiers, he was appointed Inspector-general of Military Schools. In 1848, he was made a prebendary of St Paul's Cathedral, London. G. has written a great variety of biographical, historical, and religious books. The most interesting and important of all his works is his *Life of the Great Duke of Wellington* (1859, new ed. 1862).

GLEI'WITZ, a town of Prussia, in the south-east of the province of Silesia, is pleasantly situated on the Klodnitz, a small affluent of the Oder, 43 miles south-east of Oppeln. It contains three churches, a synagogue, and a Catholic gymnasium, and is noted for its royal foundries, iron-works, leather manufactures, spinning and weaving. Pop. 9787.

GLENCOE', a valley well known not only for the terrible massacre through which it has become historically famous, but also for the wildness and sublimity of its scenery, is situated in the north of Argyleshire, near the border of Inverness, at Loch Leven. It is about eight miles in length, and is divided into an upper and lower valley by a gentle ridge. It is traversed by a mountain-stream called the Cona, and its scarred sides shew the beds of numerous mountain-torrents. After entering the glen, the traveller looks in vain for any token of social life or of civilisation.—MASSACRE OF GLENCOE. The principal circumstances of this famous tragedy are briefly as follows. The state of the Highlands in the year which followed the parliamentary session of 1690 was such as to give the government much anxiety. The civil war which had recently been flaming there continued still to smoulder, and at length it was determined, at court, to employ £12,000 or £15,000 in quieting and reconciling the refractory clans. The Edinburgh authorities issued a proclamation exhorting the clans to submit to William and Mary, and offering pardon to every rebel who would swear on or before the 31st December 1691 to live peaceably under the government of their majesties, and threatening to treat all who refused to do so as enemies and traitors. All the chiefs submitted before the 31st December except MacIan, the chief of the Macdonalds of Glencoe, whose submission, from unforeseen causes, was delayed till the 6th of January. The magistrate before whom he took the oath of allegiance transmitted a certificate to the Council at Edinburgh, explaining the circumstances of the case. That certificate was never laid before the Council, but was suppressed by an intrigue, directed (it is supposed) by the Master of Stair (Sir John Dalrymple, afterwards second Viscount and Earl of Stair), on whom, undoubtedly, rests the chief blame of this odious transaction. The enemies of MacIan now hurried on their plans for his destruction. The Master of Stair obtained the king's signature to an order directed to the commander of the forces in Scotland, and which runs thus: 'As for MacIan of Glencoe and that tribe, if they can be well distinguished from the other Highlanders, it will be proper, for the vindication of public justice, to extirpate that set of thieves.' Accordingly, on the 1st of February, 120 soldiers—most of them Campbells, who had a personal spite against the Macdonalds—led by a Captain Campbell and a Lieutenant Lindsay, marched to Glencoe. They had been warned by Stair to do nothing by halves; they were exhorted to be 'secret and sudden;' and they obeyed their instructions. Arrived in the glen, they told the Glencoe men that they were come as friends, and only wanted quarters. For twelve days the soldiers lived in the glen. Captain Campbell, or Glenlyon as he was called from the name of his estate, while visiting daily at the chief's house, employed himself in observing carefully what avenues and passes there were by means of which the Macdonalds might escape, and reporting the result of his observations to Lieutenant-colonel Hamilton, who was approaching with troops to secure the passes. The morning of the 13th of February was fixed for the slaughter, and on the night of the 12th, Glenlyon was supping and playing at cards with those whom he meant to assassinate before dawn. At five in the morning the murderous work began. When the day dawned, 38 corpses, among which were several of women, and more dreadful still, the hand of an infant that had been struck off in the murderous tumult, were lying in or around the village in their blood. But the massacre comprehended only a small portion of the tribe, for Hamilton not having come up in time, the passes were open, and about 150 men, and probably as many women, escaped, but only in many cases to perish from cold or hunger among the snows in the high mountain-gorges. When Hamilton did arrive, he was disappointed in finding the work so imperfectly done, and seizing an old Highlander, whom, being above seventy, the other butchers had agreed to let live, murdered him in cold blood. The huts of the village were then set on fire, and the troops departed, driving away with them all the flocks and herds of the glen.

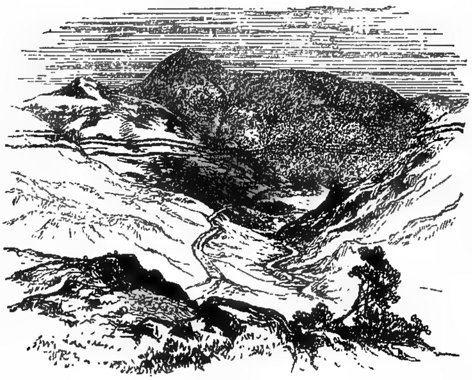
The question as to the share of King William in the guilt of this transaction has been discussed with no little warmth on both sides. Lord Macaulay pleads, in vindication of the king's conduct, that the certificate detailing the submission of MacIan had been suppressed; that he knew the Macdonalds only as a rebellious clan, who had rejected his conciliatory offers; and that, in signing the order for their extirpation, he certainly never intended them to be murdered in their sleep, but merely that their organisation as a predatory gang should be broken up.—The scene of the massacre is visited annually by tourists, who are accommodated with conveyances in connection with Hutcheson's steam-vessels from Glasgow.

GLENDOWER, or **GLENDWR**, OWEN, a Welsh chief, who was one of the most active and formidable enemies of Henry IV. of England. He was descended from Llewelyn, the last Prince of Wales, and followed the fortunes of Richard II. to the close, when, in 1399, Henry of Bolingbroke usurped the crown, and assumed the title of King Henry IV. Taking advantage of G.'s known attachment to the dethroned monarch, Lord Grey of Ruthyn seized part of his land. G.'s suit for its restitution was dismissed by parliament, and then Lord Grey seized the rest of his land. Revenge and despair, conspiring with a martial disposition, and the encouraging prophecies of the Welsh bards, drove him to take up arms, and provided him with followers. In 1400, he commenced operations by seizing the estates of Lord Grey. The king ordered his subjugation, and granted his estates to his brother the Earl of Somerset. G.'s forces were inferior in number to those of his adversaries. He was sometimes victorious, chiefly through surprises, ambushes, and the like, but sometimes defeated, and forced to retire to the hills, where his positions and rude fortifications could not be approached. In 1402, he drew Lord Grey into an ambush, and took him prisoner. This nobleman was ransomed on paying 10,000 marks, and the king, out of jealousy of the Earl of March (a boy of ten, the true heir to the crown), or some similar cause, allowed him to pay his own ransom. Immediately on his release, Lord Grey married a daughter of G.; and it would appear that Sir Edmund Mortimer, the uncle of the Earl of March, married another, having been captured also a little later by G., in a battle in which 1100 of Mortimer's followers were left dead upon the field. Treason seems to have been falsely imputed to Mortimer as the cause of his defeat; but Henry IV.'s suspicions and G.'s kindness soon made the treason sufficiently real, for Mortimer induced his sister's husband, Earl Percy (Hotspur), to conspire with him and G. (now proclaimed Prince of Wales) against the government. Percy led with him into the same enterprise the Scotch Earl Douglas, whom he had just taken prisoner at Homildon Hill. This coalition against royalty ended in the battle of Shrewsbury, in July 1403, in which the fall of Hotspur and the late arrival of G. gave the victory to the king and his forces. In June of the following year, G. entered into a treaty with Charles VI. of France against the English. Little came of it, for next year, G. sustained severe reverses, and was driven to wander among the caves of the mountains with a handful of adherents. Another two or three years saw his fortunes somewhat in the ascendant, and they fluctuated in the ordinary levels of the petty warfare of a bold barbarous chief, with mountains to escape to against the advance of superior civilised numbers, which he could no more resist on the plains than they could destroy him among the mountains. He died a natural death in the house of one of his daughters, on the 20th September 1415, aged about 65, having spent the last fifteen years of his life in constant turmoil and warfare. His successes shew that he had about the highest talents of his class, and he had their faults also. The popular idea of him is to be found in Shakspeare's *King Henry IV.* From the first, he has been a kind of mythical hero, and the lapse of centuries does not clear up the exact facts of his history. His rebellions were the expiring fires of the independence of Wales, which the English kings had been treading out for nearly a century and a half.

GLENE'LG is a shallow river of considerable length, which rises in the south-west part of Victoria, and which, after crossing the boundary into South Australia, enters the Southern Ocean between Cape Northumberland on the west, and Cape Bridgewater on the east. Its mouth is about lat. 38° S., and long. 141° E.

GLENLI'VET, a vale or district in the south-west of Banffshire, extends along the course of the Livet, a small feeder of the Avon, at the distance of about 21 miles south-west from Huntly. It contains iron ore and lead, and has long been famous for its finely flavoured whisky. Here a battle took place between the Earl of Argyle and the Earl of Huntly in 1594, resulting in the defeat of the former.

GLENROY', Parallel Roads of. The Roy is a small stream in the district of Lochaber, Inverness-shire, having a course of about 15 miles, and falling into the Spean at Inverroy, opposite to Ben Chlinaig, the eastern spur of Ben Nevis. The steep narrow valley through which the Roy runs is remarkable for having its faces marked with three shelves, which appear as lines running right round it; they are everywhere perfectly horizontal and parallel to each other, and in each case the line on one side of the glen corresponds exactly in elevation to that on the other. The granitic and metamorphic rocks, of which the mountains are composed, are covered with a greater or less thickness of angular fragments and earth, and an examination of the shelves shews that they are worn out of this soft alluvial coating. The accompanying sketch explains their structure. They almost invariably form a gentle slope from the hillside, and are from 3 to 30 feet wide. The protrusion of the rocky body of the mountain, and the furrows of mountain torrents, break their continuity; but with these exceptions, one or more of them may be traced along the whole valley. The highest, which is 1139½ feet above the sea-level, is easily followed from the watershed between the Roy and the Spey (which is at the same elevation), along both sides of the valley, as far down as the point at which the valley narrows above Glen Glaster. The second shelf is 80 feet lower, runs parallel with the first all round the head of the valley, and is continued further down until it includes Glen Glaster. The third line is 212 feet lower than the second; it may be traced along both sides of Glenroy, and round the mouth of the glen into the valley of the Spean, whose sides, at the same elevation of 847 feet, is marked from within 3 miles of the river Lochy up nearly as far as Loch Laggan. What is very curious, the elevation of the highest shelf corresponds with that of the watershed at the head of Glenroy (where it opens towards the valley of the Spey); the second corresponds with the watershed at the head of Glen Glaster (where it opens towards Glen Spean); and the third is at the same level with the valley of passage between Spean and Spey at Muckall. There is yet a higher shelf in the neighbouring Glen Gluoy, at an elevation of 1159½ feet above the sea.



Glenroy.

Many attempts have been made to explain the origin of these remarkable shelves. Their forming somewhat level roads around the valley, originated the popular notion, that they were made for the convenience of the heroes whose exploits are sung by Ossian. Playfair, in 1816, supposed they were aqueducts for artificial irrigation. Macculloch believed them to be the shore-lines of fresh-water lakes, which gradually washed away their barriers, remaining for a longer space at the height of the various shelves. Sir T. D. Lauder embraced and illustrated the same view. Darwin considered that the glens were former arms of the sea, and that the shelves indicated periods of rest in the elevation of the land. Agassiz and Buckland returned to the opinion of Macculloch, but finding no indication or remains of any solid land barrier, they referred the lake to the glacial period, and held that two large glaciers came down from Ben Nevis, the one near the centre of the mountain, and the other along the basin of Loch Treig, and that these dammed up the water in the included portion of Glen Spean and in Glenroy. In a paper subsequently published by Mr David Milne, the lacustrine theory was reverted to, with several new and plausible illustrations. The reader is referred to a work of Mr R. Chambers (*Ancient Sea-margins*, 1848) for a full account of this remarkable district. He enumerates no less than 21 terraces or shelves, in addition to the four prominent ones already described, at heights varying from 325 to 1495 feet. And uniting all these into a regular series, he endeavours to shew that they are owing to the recession of the sea from these glens, and that the intensity of the shore-markings depended upon the angle at which the hill met the water, the nature of the surface of the hill, and the quietness of the water.

GLENTI'LT, a deep, narrow valley in the north of Perthshire, extends in a south-west direction from the Grampians on the north to Strathgarry on the south, and is 15 miles in length. Through the bottom of the glen the Tilt rushes with great impetuosity, and the mountains on each side are scored with innumerable torrents. Its upper half is enclosed among mountains of from 3350 to 3589 feet high, and its left boundary is mainly formed by the huge Ben-y-Gloe, which rises from a broad base, and has many summits, the highest being 3725 feet above sea-level. The lower half is less wild. This glen is classic ground to the geologist. Two elaborate accounts of its geological phenomena have been published—one by Dr M'Culloch, to be found in the *Transactions of the Geological Society;* and the other by Lord Webb Seymour, which appears in the *Transactions of the Royal Society of Edinburgh.*

GLIDDON, George R., American Egyptologist, antiquary, and ethnologist, was born in 1807 in Grand Cairo, Egypt, where his father, John Gliddon, was for many years United States consul. He resided for 32 years in the valley of the Nile and in the Levant, and had extraordinary opportunities for pursuing those scientific researches to which he appears to have devoted a large portion of his life. He filled, for several years, the post of United States consul at Cairo.

About the year 1840, Mr G. visited London, Paris, and his own country, to which he had been so entirely a stranger. In the United States, he gave lectures in all the principal cities from Boston and New York to Mobile and New Orleans on Egyptian and other Oriental antiquities. His earliest work, *Ancient Egypt, her Monuments, Hieroglyphics, History, and Archæology*, &c., was so successful, that 18,000 copies were sold in America alone in three years. It has passed through many editions. He published also, at about the same period, an *Appeal to the Antiquaries of Europe on the Destruction of the Monuments of Egypt; Discourses on Egyptian Archæology; A Memoir on the Cotton of Egypt;* and *Otia Ægyptiaca.*

In the course of his travels in the United States, Mr G. formed acquaintances with men of science who were interested in his Egyptian researches, and who, in turn, interested him in a broader range of ethnological investigations. Conspicuous among these were Dr Morton of Philadelphia, distinguished for his craniological investigations; Dr Nott of Mobile, Alabama; Professor Agassiz, the naturalist; and others. He wished now to avail himself of the advantages of European museums and libraries, but had not the necessary means. He found, however, a generous friend in Mr Richard K. Haight of New York, who imported costly works from Europe, not then to be found in America, and also furnished him with money for a visit to London, Paris, and Berlin. The results of his studies are to be found in two quarto volumes, published by Mr G., with the co-operation of Dr Nott, and several other savants, both European and American. In 1854 was published *Types of Mankind, or Ethnological Researches based upon the Ancient Monuments, Paintings, Sculptures, and Crania of Races*, &c., by J. C. Nott, M.D., of Mobile, Alabama, and George R. Gliddon; and containing papers by Dr Morton, Professor Agassiz, and Drs Usher and Pattison of Philadelphia. In 1857 was published, also in a handsome quarto volume, *Indigenous Races of the Earth, or New Chapters of Ethnological Inquiry*, including Monographs by M. Alfred Maury, Librarian of the French Institute; Francis Pulszky, a learned Hungarian; and Professor Meigs of Philadelphia. This work bears also the joint names of Nott and G.; and Mrs Gliddon, an accomplished artist, gave her assistance in drawing upon the wood the engravings with which it is profusely illustrated. Just as this work was published, Mr G. died at Panama, Isthmus of Darien, whither he had gone to pursue his ethnological researches.

Mr G. was an enthusiast, not only in his investigations, but in the advocacy of his theories or convictions, and is unsparing in his criticisms of his opponents. He has laboured to prove the great antiquity and diversity of origin of the human races. His works have been severely criticised and condemned by those who hold to the popular chronology and the unity of the race. The materials he has brought together are valuable and suggestive; but his treatment of them can scarcely be considered satisfactory; and he is not free from the suspicion of a bias in favour of the enslavement of certain of those whom he considered inferior races.

GLI'RES (Lat. plural of *glis*, a dormouse), in the Linnæan system of zoology, an order of Mammalia almost exactly corresponding to the *Rodentia* (q. v.) of Cuvier and other more recent naturalists.

GLOBE-FISH. See Diodon.

GLOBE-FLOWER (*Trollius*), a genus of plants of the natural order *Ranunculaceæ*, having a calyx of coloured (yellow) sepals, in number five or some multiple of five, the petals small and linear. There are several species, natives of the colder parts of the northern hemisphere. The common G., the Lucken Gowan of the Scotch (*T. Europæus*), is the only species found in Britain, and chiefly in the northern parts, where it is one of the finest ornaments of moist grounds and river-banks in somewhat elevated districts. It is sometimes cultivated in flower-gardens. The name G. is derived from the appearance which the flower presents, the sepals being curved so that it forms almost a perfect yellow globe or ball. It is a native of all the northern parts of Europe, and also of the Alps.

Globe-Flower (*Trollius Europæus*).

GLOBES. A globe is a round or spherical body (see Sphere), and in the singular number the word is often used to signify the earth, as in the phrase, 'the terraqueous globe;' but by 'globes,' or 'the globes,' we usually mean a pair of artificial globes used as a part of school-room apparatus. These globes are hollow spheres of card-board, coated with a composition of whiting, glue, and oil, upon which paper bearing certain delineations is laid. On one of the pair—the *celestial* globe—are represented the stars, so placed that, to an eye supposed to observe them from the centre of the globe, their relative position and distance correspond to those actually observed; while on the *terrestrial* globe, the distribution of land and water, the divisions and subdivisions of the former, together with a few of the most important places, are laid down in the positions corresponding to those which they actually occupy on the surface of the earth.

The usual mode of manufacture is as follows: A ball of wood or iron is used as a matrix, and a layer of damped paper is carefully and closely placed upon this, without paste, and other layers are successively pasted over the first one; ordinary card-board is thus produced, but instead of being flat, as usual, it forms a spherical shell. When sufficiently thick, this is cut into two hemispheres, the section being made in the line of the intended equator. The hemispheres are then taken off the matrix, and again glued together on an axis, and the whiting composition laid on, the outside of which is smoothed and finished to shape in a lathe. The workman has to lay on this composition so as to balance the globe, in order that it may rest at whatever point it is turned. The smooth surface is now marked with the lines of latitude and longitude, and is covered with the paper on which the required geographical or astronomical delineations are engraved. In order to adapt the plane surface of the paper to the curvature of the sphere, it is printed in pieces, small circles for the Arctic and Antarctic regions, and the rest in lens-shaped gores, varying from 20° to 30° of longitude, and meeting these circles which are pasted first. Great care is required in laying on these curved pieces, so that their edges shall meet exactly without overlapping. The surface is then coloured, and strongly varnished, and mounted in its frame and stand.

Globes of india-rubber and gutta-percha have also been made, others of thin paper, to be inflated and suspended in a school-room. Betts's paper-globes fold up when not in use. Embossed globes shew, in exaggerated relief, the elevations and depressions of the earth's surface. Compound globes including the celestial and terrestrial, are made with an outer glass sphere for the celestial, and orrery mechanism to shew the varying relative positions of the sun and moon, &c.

As school-room apparatus, globes are used for the purpose of illustrating the form and motion of the earth, the position and apparent motion of the fixed stars, and for the mechanical solution of a number of problems in geography and practical astronomy. For this purpose, each globe is suspended in a brass ring of somewhat greater diameter, by means of two pins exactly opposite to each other—these pins forming the extremities of the axis round which it revolves, or the north and south poles. This brass circle is then let into a horizontal ring of wood, supported on a stand, as represented in the art. ARMILLARY SPHERE; in which the lines drawn on the surface of globes are also explained. The globes in common use in schools are 12 inches in diameter; those to be found in private libraries are more frequently 18 inches.

The problems to which the globes are applied are such as: To find when a star rises, sets, or comes to the meridian on a given day at a given place. The mode of solution will be found in any school-book on the subject. The answers obtained in this way to such questions are only very rough approximations, and are in themselves of little or no value. But 'the use of the globes,' as it is called, serves the purpose of making evident to the senses how many of the appearances connected with the motions of the earth and the heavenly bodies are caused, and enabling the nature of the problems connected with these appearances to be clearly conceived. It is only by trigonometrical calculation that the accurate solutions can be obtained.

GLO'BULINE, or **CRY'STALLINE**, is one of the proteine bodies or albuminates. In association with hæmatine, as hæmato-globulin, it is the main ingredient of the blood globules; and it occurs, mixed with albumen, in the cells of the crystalline lens of the eye, forming, according to Simon, from 10 to 14 per cent. of the dry lens. Hence its two names. In most of its relations it resembles albumen, but differs from that substance in being precipitated both from acid and alkaline solutions by exact neutralisation, and in being completely thrown down from its solutions by carbonic acid gas.

GLO'BUS HYSTE'RICUS, or Ball in the Throat, the name applied to a peculiar sensation described under HYSTERIA.

GLO'CKNER, or **GROSS GLOCKNER**, the highest peak of the Noric Alps, is situated on the boundary between Tyrol, Carinthia, and Upper Austria, and is 12,431 feet in height.

GLO'GAU, or **GROSS-GLOGAU**, a town and important fortress of Prussia, in the province of Silesia, is situated on the left bank of the Oder, 35 miles north-north-west of Liegnitz. It is surrounded by walls, and is otherwise fortified; and is connected by a wooden bridge with a strongly fortified island in the Oder. It has a beautiful castle, two gymnasiums, one Catholic, and the other Protestant; and numerous religious and educational institutions. On the island in the Oder is a cathedral dating from 1120, and containing a Madonna, the masterpiece of Cranach, Sen. Manufactures of woollens, printed calicoes, hosiery, tobacco, paper, and sugar, and some trade and commerce are carried on. Pop. 16,656, including a garrison of 3653 men.

GLO'GGNITZ, a small town of Austria in the province of Lower Austria, is situated on the Schwarza, at the northern base of the Semmering Alp, a branch of the Noric chain, 45 miles south-south-west from Vienna. Pop. 1200. It is a station on the Vienna and Trieste Railway, and stands at the northern extremity of that portion of it known as the *Semmeringbahn*, or railway of the Semmering. This portion of railway is perhaps the most extraordinary work of its kind in Europe. It sweeps up the steep rocky face of the mountain in many curves, and descends its southern slope, after having passed through 15 tunnels and crossed as many bridges. It extends from G. on the north to Mürzzuschlag on the south, a distance of 25 miles. The greatest elevation is reached 23½ miles south of G., where the line is 2872 feet above sea-level, and 1504 feet above its height at Gloggnitz. To this point the line rises in gradients of from 1 in 40 to 1 in 100; the average rate of ascent, however, is 1 in 82. At its greatest elevation, the line pierces the Semmering in a tunnel 4633 feet long. Quick trains take 1 hour and 42 minutes to traverse these 25 miles; slow trains require 2 hours 33 minutes. The *Semmeringbahn* was constructed for the Austrian government by

Carlo Chega, an eminent engineer, between the years 1848 and 1853.

GLO'MMEN, or STOR-ELV (i. e., *great river*), the largest river in Norway, rises from Lake Aursund, at the town of Röros, in lat. about 62° 40′ N., and long. 11° 16′ E. Its source is 2419 feet above sea-level, and its course is interrupted by frequent water-falls, the last of which, with a descent of 60 feet, is called the Sarpenfos or Sarp-fos, and occurs at about 10 miles from the mouth of the river. Large boats can ascend to the Sarpenfos. The G. flows first in a south-west direction for about 50 miles, then bends toward the south-east, and pursues that direction until it passes the fortress of Kongsvinger, after which it again turns south-west, and empties itself into the Skager Rack at Frederickstadt, after a course of about 400 miles. Its most important affluents are the Rena on the left, and the Vormen on the right.

GLO'RIA, a hymn in the Roman Catholic Church service, beginning with the words, 'Gloria in excelsis Deo.' Its place in the mass is after the 'Introitus,' except on the penitential days in Advent and during Lent, when it is omitted. It is founded on the 2d chapter of St Luke, 14th verse. It has been so long in use that it is not known by whom it was introduced into the service in its present form. It is also called 'The Great Doxology,' to distinguish it from the 'Gloria patri filio et spiritui,' which is sung at the end of the Psalms and antiphonal hymns.

GLORIO'SA, a genus of plants of the natural order *Liliaceæ*, having a perianth of 6 elongated and reflexed segments, a 3-lobed stigma, a 3-celled superior germen, and globose seeds. The best known species, *G. superba*, a native of India, is a herbaceous perennial with a weak stem, 6—10 inches high, alternate leaves terminating in tendrils, and very beautiful flowers, finely coloured with red and yellow.

GLORIOUS VIRGIN, or **ST MARY THE GLORIOUS**, an order of knighthood in Venice, founded by Bartholomew of Vicenza, and approved by Pope Urban IV. in 1262. This institution was ecclesiastical as well as military, and its objects were the protection of widows and orphans, and the furtherance of the peace of Italy. The badge was a purple cross between certain stars, and the costume a white surcoat on a russet cloak.

An order of knighthood of St Mary the Glorious also existed in Rome in the 17th c., whose purpose was the suppression of the Barbary corsairs who infested the Mediterranean.

GLOSS (in Biblical criticism), Gr. *glossa* (tongue, or language), an explanation of purely verbal difficulties of the text, to the exclusion of those which arise from doctrinal, historical, ritual, or ceremonial sources. The words which are commonly the subject of these glossarial explanations are reducible to five classes: (1) foreign words; (2) provincialisms or dialects; (3) obsolete words; (4) technical words; and (5) words used by the author in some abnormal or exceptional signification. From an early period, these verbal difficulties were the object of attention, and the writers who devoted themselves to the elucidation were called *glossatores*, and their works *glossaria*. The principal Greek glossatores are Hesychius, Zonaras, Suidas, Phavorinus. Most of the Rabbinical writers have done the same work for the Hebrew text; so that it would be difficult to name any in particular as Hebrew glossatores. The chief glossatores of the Latin Vulgate are the celebrated Walafried Strabo in the 9th c., and Anselm of Laon in the 12th, for the Latin Vulgate.

In Roman and canon law, the practice of introducing glosses was of early origin, and probably was an imitation of the biblical glosses. Among jurists, the gloss was not purely verbal, but regarded the true interpretation of the law, and in some cases it was held to be of equal authority with the text itself. From the position which it occupied in the MS., being generally written between the lines of the text and on the margin, it was called *glossa interlinearis*. The gloss of the Roman law is written in very pure Latinity, that of the canon law in the Latinity of the medieval schools.

GLOSSI'TIS (Gr. *glossa*, the tongue), inflammation of the tongue. The disease in its most acute form is rare; it is sometimes due to injury, or to scald; in other cases, to the action of mercury on the system. The tongue becomes enormously swollen, and one of the chief dangers of the attack is suffocation from swelling of the parts about the hyoid bone, and closure thereby of the glottis (see LARYNX). The only really effective treatment is to make pretty deep incisions into the inflamed part, keeping in view that the resulting wound is likely to be much less than appears at the time; for the enlargement of the organ has stretched the mucous membrane, and infiltrated all the textures with fluid, while the vessels also are distended with blood. A straight bistoury should be boldly plunged into the upper surface, and several incisions made lengthways sufficiently deep to evacuate the confined fluids. A good deal of blood will usually follow, but if care has been taken not to injure the lingual artery or its branches (see TONGUE), there is no real danger from this cause. In places at a distance from medical advice, this operation might require to be performed by unskilled hands, and with a penknife or any other cutting instrument at hand; care should be taken in this case to make the incisions on the upper surface, and not too far from the middle line.

GLOTTIS. See LARYNX.

GLOU'CESTER, a city and county in itself, the chief town of the county of the same name, an inland port, cathedral town, watering-place, and the seat of some important manufactures, situated on the left bank of the river Severn, distant west-north-west from London 107 miles by road, and 114 by rail, and from Bristol 36 miles north-north-east. G. is clean and well built, with four principal streets, of convenient width, meeting at right angles in the centre of the city. The docks are spacious, and communicate with the open part of the Severn, below Sharpness Point, by means of a ship-canal 17 miles in length, while the wharfs, about 1000 feet in length, are directly connected with the several railways. The foreign trade is principally with the Black and Baltic seas, Canada, the West Indies, and France; the foreign import returns for 1861 give 458 vessels, and an aggregate tonnage of 130,947; exports, 98; tonnage, 20,676. Coasting-trade inwards, 994 vessels, of 40,584 tons; outwards, 3561; tonnage, 141,040. G. is connected by the Midland Railway with the north, by the Bristol and Gloucester Railway with the west and south, by the Great Western with London and the east, and by the South Wales Railway with the principality. Besides affording a market for the produce of the surrounding districts, G. imports corn, timber, wines, and spirits in considerable quantities, has a large export trade in iron and steel goods, coal, soap, malt, and potter-ware, railway-fittings, agricultural implements, bells, pins, chemicals, and hempen goods.

The principal building in G. is the cathedral, cruciform in structure, and presenting beautiful examples of several different eras of ecclesiastical architecture, 427 feet in length, and 154 in width; the height of the central tower, its greatest external ornament, is 223 feet; the cloisters also, of great beauty, form a large square. Formerly the church of a Benedictine abbey, it was converted into a cathedral in 1541. There are, besides the cathedral, 12 churches of the Establishment; 2 Wesleyan and 2 Independent chapels; 1 Catholic, Baptist, Methodist, Friends, Unitarian, and Lady Huntingdon's Chapel, a grammar-school, many excellent public and private schools, a neat theatre, assembly rooms, town-hall, jail, and lunatic asylum. G. returns two members to parliament. Pop. (1851), 17,572; (1861), 16,320. It is noted as one of the three cities (Worcester and Hereford being the other two) at which the musical festivals of the three choirs are alternately held. The history of G. is traceable to a very remote antiquity; it was the Caer Glow of the Britons, Colonia Glevum of the Romans, and an important town in Mercia under the Saxons, by whom it was called *Glean-Ceaster*—whence its present name. Here the celebrated single combat between Edmund Ironsides and Canute is said to have taken place. G. was repeatedly visited by William I., afforded a refuge and support to Queen Matilda in her contest with Stephen, saw Henry III. crowned, and parliaments held under Richard II. and Henry IV., and sided successfully with the parliament in the civil war against Charles I. Robert of Gloucester, the metrical historian; Miles Smith, biblical translator; the Poet Taylor; and R. Raiks, the founder of Sunday schools, were natives of Gloucester.

GLOU'CESTER, a town, seaport, and fishing-station of North America, in the state of Massachusetts, is situated on the south side of Cape Ann, about 28 miles north-east of Boston. It is handsomely built and finely situated, and commands extensive sea-views. Its 'harbour,' one of the best on the coast, is roomy, safe, easily accessible, and deep enough to admit vessels of the largest size. G. is said to be the first fishing-town in the United States. The fishing vessels in 1859 numbered 357, and were manned by 3890 fishermen. In 1855 the mackerel fishery realised 388,809 dollars, or over £80,000; and the cod fishery 293,850 dollars, or over £60,000. The town has, besides, extensive manufactories of anchors, cables, sails, oil, soap and candles, and provisions. G., which is connected with Boston by a branch-railroad, has recently become a favourite summer resort for sea-bathing. Pop. (1855), 8935; (1859), estimated at 12,000.

GLOU'CESTERSHIRE, a county of England, lying around the lower course of the Severn and the estuary of that river, is bounded on the W. by Monmouth and Hereford, on the N. by Worcester and Warwickshire, on the E. by Oxfordshire, and on the S. by Somerset and Wilts. Area, 805,102 acres; pop. (1851) 458,805; (1861) 485,502. The shape of the county resembles a parallelogram, and though its outline is still somewhat irregular, especially in the north, it is much less so than formerly, as by act 7 and 8 Vict. c. 61, outlying portions of the county of G. were annexed to the counties in which they were respectively situated; and, in like manner, detached pieces of land belonging to other counties, but situated in G., were declared portions of that county. There are three distinct districts in this county, the natural features of each being different. These are the Hill, the Vale, and the Forest districts; the first formed by the Coteswold or Cotswold Hills (q. v.), the second, comprising the vales of Gloucester and Berkeley, by the rich and low meadow-lands lying along the banks of the Severn; and the third consisting of the land west of the Severn, which is occupied chiefly by the Forest of Dean. The county is watered principally by the Severn, the Wye, the Upper and Lower Avon, and the Thames or Isis, which receives all the streams on the east of the Cotswold Hills. The soil is thin on the hills, but produces good pasturage for sheep, while the lower tracts abound in excellent grass and arable lands. The vales of G. are remarkable for the early maturity of their agricultural produce. The famous Double and Single Glo'ster cheese is produced at Berkeley, in the vale of that name, and is sold throughout the kingdom. The Forest of Dean, 20,000 acres of which are still crown property, is highly picturesque in appearance, and contains many apple-orchards, from which a favourite cider is made. A lord-warden, who is constable of the castle of St Briavel's, with six deputy-wardens, and other officers, superintend the government of the forest. In this county, numerous and important manufactures are carried on; of these, the manufacture of woollen cloth, of the better qualities, is the chief; hats, felt, stockings, pins, cheese-cloths and other linens are also produced in considerable quantities. The county sends four members to the House of Commons.

G., previous to the Roman invasion, was inhabited by a tribe called the Dobuni; and after that event, the county, or the greater part of it, was included in the province named *Flavia Cœsariensis.* From the earliest of the Danish invasions down to the battle of Tewkesbury, in 1471, and to the civil wars between the crown and parliament, G. has been the scene of many and disastrous encounters. It contains numerous Roman relics in camps, roads, coins, fragments of statuary and pottery, tesselated pavements, &c. There are also many traces of British, Saxon, and Danish works in the county.

GLOVER, Richard, was born in London in 1712, and was educated at Cheam, in Surrey. He was a merchant in his native city, and in 1760, became member of parliament for Weymouth. His first poem, to the memory of Sir Isaac Newton, was written in his 16th year. His chief poem, entitled *Leonidas*, was published in 1737, and passed through several editions. A continuation of it, the *Atheniad*, was published in 1787. These poems are in blank verse, and of prodigious extent. Although not deficient in a certain majesty and elevation of tone, they are in the main turgid and heavy, and are now almost entirely forgotten. He wrote several tragedies, which did not meet with success. His most popular poem, *Hosier's Ghost*, written on the taking of Carthagena from the Spaniards, was published in 1739. He died in 1785; and in 1813, appeared a diary, or part of a diary written by him.

GLOVES. Gloves are made of various materials, such as silk, wool, linen, cotton, fur, and various kinds of leather. The latter material is the most abundantly used, and the mode of making it up is the most characteristic of this branch of manufacture. We need scarcely inform the reader that the term 'kid' is a mere technicality, as the quantity annually consumed of leather bearing this name is largely in excess of what could be supplied from the skins of all the young goats that are annually slaughtered. It is chiefly made from lamb's skin. A few of the finest gloves are made from real kid skins, obtained from those countries where goats' milk and flesh are articles of food. Dogskin, buckskin, and doeskin gloves are made chiefly from sheepskin; some of the thickest kinds of leather gloves are made from calf-skin. The leather in all cases undergoes a much lighter dressing than when used for boots and shoes.

Worcester is the chief seat of the English leather glove-manufactory; gloves are also made at Ludlow, Leominster, and Yeovil, besides Woodstock, where a peculiar and superior doeskin glove is made bearing the name of the town. Limerick and the neighbourhood has long been celebrated for gloves.

The French, however, still excel us in this branch of manufacture. Up to 1825, the importation of French gloves was prohibited, and the competition consequent upon the removal of this prohibition had the usual effect of producing a rapid improvement in the English manufacture. Very cheap and good gloves are made at Naples; and they are much in request on the continent.

After the leather has been properly prepared, it is cut into pieces of the required size, then folded over somewhat unequally, as the back should be larger than the front. Three cuts are then made through the doubled piece to produce the four fingers; an oblong hole is cut at the bending of the fold for the insertion of the thumb-piece: the cutting of this of the exact shape and size requires considerable skill. The first and fourth fingers are completed by gussets or strips sewed only on their inner sides, while the second and third fingers require gussets on each side to complete them. Besides these, small pieces of a diamond shape are sewed in at the base of the fingers towards the palm of the hand. The stitching together of these pieces requires much care, as the junction must be made as closely as possible to the edge of each piece, and yet with sufficient hold to keep the stitches from cutting through the material. A kind of vice or clamp, with minute teeth to regulate the stitches, is sometimes used for this purpose; and sewing-machines are applied as far as practicable, especially for the ornamental or embroidery stitching on the backs. The putting in of the thumb-piece requires special skill and management. Badly made gloves commonly give way at this part. The superiority of the French and the best English gloves depends chiefly upon the adaptation of their shape to the structure of the hand by giving additional size where the flexure of the hand requires it. The best woollen, thread, and silk gloves are made as above by cutting and sewing together, but commoner gloves are made to a great extent by knitting and weaving in like manner to stockings.

Glove-dyeing.—The dye is lightly washed over the stretched glove, a second and third coat being given after the first is dry. When this is thoroughly dried, the superfluous colour is rubbed off, and the surface smoothed by rubbing with a polished stick or piece of ivory. The surface is then sponged over with the white of egg.

Glove-cleaning.—Oil of turpentine or camphine was the material chiefly used for cleaning kid gloves, but of late this has been to a great extent superseded by Benzole (q. v.) or benzine, which is abundantly obtained in sufficient purity for this purpose by the careful rectification of coal-naphtha. The chief advantages of this latter material is, that it is more volatile, and its odour less persistent than that of ordinary turpentine, or even of the best rectified camphine which has been much exposed to the atmosphere. The mode of using either of these is to stretch the gloves over a wooden hand of suitable size, and then sponge them with the fluid, removing the first or dirty portion with a second wash of clean fluid. By collecting the washings separately, and allowing them to stand till the dirt settles, the same turpentine or benzole may be used over and over again.

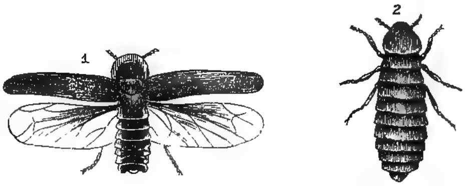
An inodorous composition may be made by dissolving one part of soap-shavings in two parts of rain or distilled water, using heat to aid the solution. This is improved by adding to it a small quantity of liquor ammonia and any ordinary perfume. It should be applied to the glove stretched on the stock by rubbing with a piece of flannel always in one direction.

Doeskin and wash-leather gloves, when not very dirty, may be cleaned dry by rubbing them when stretched on a stock with a mixture of finely powdered fuller's-earth and alum, then sweeping off this powder with a brush, and dusting with dry bran and whiting. If the gloves are very dirty, they should be washed with the soap solution, then rubbed with pipe-clay mixed with yellow ochre or amber (according to the shade required), made into a paste with ale or beer, then carefully dried and dusted to remove the superfluous powder.

Glove Powder, for cleaning gloves, is made by carefully drying Castile soap, and then pounding it in a mortar; or of pipe-clay coloured with yellow ochre or Irish slate, or it may be made of a mixture of pipe-clay and powdered soap.

GLOVES (in Law). It is an old custom in England on a maiden assize—i. e., an assize on which there is no offender to be tried—for the sheriff to present the judge with a pair of white gloves. The clerk of assize and the judges' officers have money given to them on the same occasion, which is called *glove* silver. The custom of presenting white gloves to the judges on a maiden circuit is also observed in Scotland.

GLOW'WORM, the name given to the wingless females of certain coleopterous insects of the family *Lampyridæ*, remarkable for the luminosity of some of the last segments of the abdomen. The insects of the family *Lampyridæ* have five joints in all the *tarsi*, the antennæ toothed, the elytra (wing-covers)—at least of the males—covering the whole abdomen, the whole body soft and the elytra flexible, the females often destitute both of wings and elytra, the thorax projecting over and almost concealing the head. When seized, they place their feet and antennæ close to the body, many of them also curving the abdomen downward, and simulate death. The Common G. (*Lampyris noctiluca*) is abundant in some parts of England, and rare in the south of Scotland. The antennæ are short. The male has very large eyes. The female, which is larger than the male, is fully half an inch in length, of a blackish colour, the legs dusky red, and the thorax and abdomen margined with that colour. The female is perfectly destitute both of wings and elytra. The habits of the insect are nocturnal. The male emits a faint light, the female a soft but strong light, of which the use is supposed to be to attract and guide the male. The female G. is generally to be found, during the summer months, among grass, or on mossy banks. There is reason to think that the G. has the power of displaying and extinguishing its light at pleasure, so that it may not be



Glowworm (*Lampyris noctiluca*): 1, male; 2, female.

unnecessarily exposed to enemies; but if the luminous portion of the abdomen be removed, it retains its luminosity for some time. If placed in hydrogen gas, it sometimes detonates. The luminous matter is capable of being mixed with water, and warm water increases its brilliancy. Two spots on the last segment of the abdomen are more luminous than any other part, and a constant motion of this segment seems to be connected with the emission of the light. The two segments next to this are each surrounded by a band brighter than the rest of the segment. The larva of the G. is very similar to the perfect female insect, but is very faintly luminous. It is very voracious, attacking and devouring snails, whereas the perfect insect eats little, and is supposed to prefer the tender leaves of plants.—Several species of G. are found in the warmer parts of Europe, and in other parts of the world. The luminosity of the males of the genus *Lampyris*, and of other winged insects of the family *Lampyridæ*, has obtained for them the name of Fireflies (q. v.).

GLUCHO'V, a town in the south-west of Russia, in the government of Tchernigov, and 112 miles in direct line east-north-east of the town of that name. It is surrounded by earthen walls, contains eight churches, has manufactures of cloth, and some trade in grain and brandy. In the vicinity, porcelain clay is obtained, and is sent north to the imperial manufactory at St Petersburg. Pop. 8856.

GLUCI'NA (more correctly, GLYCINA, from Gr. *glykys*, sweet), derives its name from its salts having a sweetish taste. It was discovered by Vauquelin, in 1797, in the emerald, and has since been found in cymophane, chrysoberyl, phenokite, the gadolinites, leucophane, and belvine; but in consequence of the great difficulty of preparing it, its properties and combinations have not been much studied. Berzelius regarded it as the sesquioxide of Glucinum (q. v.), in which case its formula would be Gl_2O_3, but it is now generally believed to be a protoxide, GlO. For the mode of extracting it from the emerald or other mineral containing it, we must refer to Debray's *Memoir on Glucinum and its Compounds* (a translation of which is given in the eighth volume of the *Quarterly Journal of the Chemical Society*), or to any of the larger works on chemistry. Glucina is a white, loosely coherent powder, without taste or smell. It is infusible, but volatilises at a very high temperature.

Amongst the salts of glucina that have been studied by Debray and others, we may mention the sulphates of glucina, and of glucina and potash; the carbonates of glucina, and of glucina and potash; and the oxalates of glucina, of glucina and potash, and of glucina and ammonia. They are colourless, and much resemble those of alumina.

The mineral *phenakite* is a pure silicate of glucina. The *beryl*, of which the *emerald* is a variety, is a double silicate of glucina and alumina. The mineral *euclase* is also a double silicate of the same earths; while the *chrysoberyl* is an aluminate of glucina, coloured with peroxide of iron.

GLUCI'NUM (symbol, Gl), known also as GLYCINUM, GLYCIUM, and BERYLLIUM, is a metal whose atomic weight is 4·65 (as deduced by Awdejew from the analysis of sulphate of glucina), and whose specific gravity is 2·1. It is white, malleable, and fusible below the melting-point of silver. It does not burn in air, oxygen, or sulphur, but in the first two substances it becomes covered with a thin coat of oxide. It combines readily with chlorine, iodine, and silicon. Even when heated to redness, it does not decompose water. It dissolves readily in hydrochloric and sulphuric acids, and in a solution of potash, but is insoluble in ammonia, and only slightly acted on by nitric acid. It forms one oxide, GLUCINA.

From the researches of Debray, it follows that G. should be placed side by side with aluminium. These bodies are intermediate between the precious and the ordinary metals, and both of them are characterised by the following properties: They are permanent in the air at high as well as at low temperatures; do not decompose water, even when they are at a white heat; are not attacked by sulphur, sulphuretted hydrogen, or the alkaline sulphides; are not attacked by strong nitric acid at ordinary temperatures, and only slowly, even with the aid of heat; but dissolve readily in dilute sulphuric and hydrochloric acids.

G. was first obtained from glucina by Wöhler, in 1827, who procured it by decomposing the chloride of G., which is obtained by evaporating a solution of glucina in hydrochloric acid. Debray has since (1854) obtained it much more abundantly by applying a similar mode of proceeding to that employed by Sainte Claire Deville for the reduction of aluminium.

GLUCK, JOHANN CHRISTOPH VON, a German musical composer, who may be considered the father of the modern opera, was born, July 2, 1714, at Weissenwangen, in the Upper Palatinate. He learned the rudiments of music in one of the common schools of Prague, and as a wandering musician went to Vienna, where he found opportunity to master the rules of counterpoint and harmony. In 1738, he went to Italy, to complete his musical education, and found a worthy master in San-Martini. After four years of study he wrote his first opera, *Artaxerxes*, which was performed at Milan, 1741. This was followed by *Ipermnestra* and *Demetrio*, given at Venice, 1742, and several others in the two following years, produced at Milan and Turin. Having achieved a high reputation, G. was invited to London, where his *Fall of the Giants* was represented in 1745. He found a formidable rival in Handel, whose genius he honoured, and he derived great advantages from the friendship of Dr Arne, the English composer, and his lady, an excellent singer. It was here that he began to develop the full force of that lyric genius which was destined soon to create a new order of musical composition; but the outbreak of the Rebellion in Scotland closed the opera, the singers and musicians being mostly Roman Catholics, and G. returned to Vienna. In 1754, he was called to Rome, where he wrote *La Clemenza di Tito*, *Antigono*, and several others. But he did not rise to that high style of art which distinguished his later works until he found at Florence, in Ranieri di Calzabigi, a poet whose dramas were worthy of his music. He then composed the three operas, *Alceste, Paride e Elena*, and *Orfeo*, which became the foundation of an imperishable fame. He made music the interpreter of poetry, giving to it the fullest expression. His simple, noble, and grand style filled Europe with admiration. He changed no less the action of the stage than the music. Before him all was artificial and insipid. He made everything natural and effective. At Paris, 1777, he became the rival of the great Italian composer Picini, and the city was divided into two rival factions of the Gluckists and the Picinists. He conquered with his *Iphigénie en Tauride*, 1779. Picini, who had composed an opera on the same subject, would not allow his to be performed after listening to that of his rival. His great triumph was followed by several successful works, and he enjoyed the highest patronage and prosperity. He died of apoplexy, November 25, 1787. Burney has characterised him in a single phrase, when he calls him 'the Michael Angelo of music.'

GLÜ'CKSTADT, a town of Denmark, capital of the duchy of Holstein, is situated on the right bank of the Elbe, on the Kremper Marsh, 32 miles below Hamburg. It is a pretty town, regularly built, and intersected by canals. The chief buildings are the high school, the school of navigation, the house of correction, the workhouse for Slesvig and Holstein, and the theatre. It has a safe port capable of containing 200 ships, and furnished with wharfs. The water with which the town is supplied requires to be gathered into cisterns and artificially purified. Weaving is carried on here to some extent; but trade, navigation, and whale-fishing employ the inhabitants chiefly. G. was founded in 1620 by Christian IV. of Denmark, fortified, and endowed with various commercial privileges. During the Thirty Years' War, it successfully withstood three sieges; its fortifications were demolished in 1815. It has been a free port since 1830. Pop. 6145.

GLU'COSE (or, more correctly, Glycose), known also as Grape Sugar, Starch Sugar, and Diabetic Sugar ($C_{12}H_{12}O_{12} + 2aq$), seldom occurs in distinct, well-formed crystals, but may be obtained in warty concretions, which, when examined under the microscope, are found to consist of minute rhombic tablets. It never, however, crystallises readily. It is less sweet than ordinary (cane) sugar, is soluble in water and in dilute alcohol, and its solutions rotate the plane of polarisation from left to right, this effect on a ray of polarised light being more marked than with cane sugar. At 212°, it fuses, and loses its water of crystallisation, and at a higher temperature (about 400°) it undergoes change, loses the elements of water, and becomes converted into *Caramel* ($C_{12}H_9O_9$), a brown substance, which is neither sweet nor capable of undergoing fermentation, but which is readily soluble in water, and is much used by cooks and confectioners as a colouring matter. At a still higher temperature, it becomes entirely decomposed into carbonic oxide, carbonic acid, light carburetted hydrogen (C_2H_4), acetic acid, aldehyde, furfurol, and a very bitter substance, to which the name *Assamar* has been applied.

With bases, glucose forms various definite but unstable compounds, which have been termed *saccharates*, a term which ought to have been restricted to the salts of saccharic acid. On heating an alkaline solution of glucose, decomposition ensues, and a dark-brown uncrystallisable substance is formed, which possesses acid properties, and is known as *melassic acid*. This reaction is sometimes employed for the detection of glucose, and is known as Moore's test.

Glucose has a strong reducing power, and upon this property several of its tests are based. It reduces the oxide of copper, even without the aid of heat, in alkaline solutions to the state of the yellow suboxide, and this reaction is apparent when only 0·0001 of glucose is present in the fluid. This is known as Trommer's test, and Fehling's mode of determining glucose quantitatively is based on the same reaction. In consequence of this reducing power, sugar is sometimes employed in the solution of the silver salts used for the silvering of mirrors.

Glucose readily undergoes fermentation. On mixing a solution of it, kept at a moderate temperature, with yeast, each equivalent of it breaks up into two equivalents of alcohol, and four equivalents of carbonic acid, or—

$$\overbrace{C_{12}H_{12}O_{12}}^{\text{Glucose.}} = 2(\overbrace{C_4H_6O_2}^{\text{Alcohol.}}) + \overset{\text{Carbonic Acid.}}{4CO_2}$$

Under the influence of other exciters of fermentation, as, for instance, putrid animal membranes, or other nitrogenous substances, glucose becomes converted first into lactic acid, and subsequently into butyric acid. These reactions are exhibited in the two following formulæ:

$$\overbrace{C_{12}H_{12}O_{12}}^{\text{Glucose.}} = 2(\overbrace{C_6H_6O_6}^{\text{Lactic Acid.}}) = \overbrace{C_8H_8O_4}^{\text{Butyric Acid.}} + \overset{\text{Carbonic Acid.}}{4CO_2} + \overset{\text{Hydrogen.}}{4H}$$

Under certain conditions, which are not accurately known, solutions of glucose undergo a change which is termed *viscous* fermentation. The sugar becomes converted into a viscous or ropy substance, while lactic acid and mannite ($C_{12}H_{14}O_{12}$) are formed. This kind of fermentation sometimes occurs in light-bodied white wines. Water is probably decomposed, and its hydrogen unites with a portion of the glucose to form mannite.

Glucose is a constituent of the juice of grapes, plums, cherries, figs, and many other sweet fruits, and may often be observed in a crystalline form on raisins, dried figs, &c. It likewise occurs in honey. In the animal kingdom, it is found sometimes as a normal and sometimes a pathological constituent of various fluids and tissues. Thus, it occurs normally in the contents of the small intestine, and in the chyle after the use of amylaceous and saccharine food, in the blood of the hepatic veins (see Liver), in the tissue of the liver, in both the yolk and white of birds' eggs, in the urinary secretion in minute quantity (according to Brücke, Bence Jones, and others), &c.; while in the disease known as diabetes, it exists in large quantity in the urinary secretion, and may be detected in nearly all the fluids of the body. By injuring a certain part of the medulla oblongata (the part of the spinal cord contained within the cavity of the cranium), an artificial diabetes can be produced.

The mode of formation of glucose, whether in the laboratory or in the organisms of plants and animals, requires some notice. It can be obtained chemically from starch and from dextrine by boiling them with dilute sulphuric acid, or by the action of Diastase (q. v.), and from cellulose and gum, and from most of the varieties of sugar, by treatment with dilute acids. In the liver, it is formed from the Glycogen (q. v.) which occurs in that organ, under the influence of a ferment which has been chemically separated from the hepatic tissue, but with the nature of which we are not acquainted; while in the rest of the organism it is formed from the starch which is taken with the food, the starch undergoing this transformation under the influence of ptyaline (a ferment occurring in the saliva), pancreatine (a ferment occurring in the pancreatic juice), and an unknown but corresponding ferment existing in the intestinal fluid.

The simplest method of preparing pure glucose is by treating honey with cold rectified spirit, which extracts the uncrystallisable sugar; the residue is dissolved in water, and the solution is decolorised with animal charcoal, and allowed to crystallise.

It is manufactured on a large scale, especially on the continent, from starch. A mixture of starch and water at a temperature of about 130° is made to flow gradually into a vat containing water acidulated with 1 per cent. of sulphuric acid, and kept at the boiling-point. In about half an hour, the starch is converted into sugar. The liquid is drawn off, and the sulphuric acid is neutralised by the gradual addition of chalk, till there is no longer any effervescence. The sulphate of lime is deposited, and the clear aqueous solution, after being concentrated by evaporation, is set aside to crystallise. The molasses is drained off, and the sugar is dried at a gentle heat in a current of air. 'The chief use,' says Dr Muspratt, in his *Chemistry Applied to Arts and Manufactures*, 'to which glucose is applied on the continent, is for the manufacture of beer and a coarse kind of alcohol, which is said to be extensively converted into French brandy by the addition of oil of raisins, colouring matter, &c.'

As all alcoholic drinks (ales, wines, and spirits) are obtained from fluids containing this variety of sugar as the essential constituent, and as their quality mainly depends upon the amount of sugar that is present, it is very important to have some ready means of determining its amount. A similar determination is also of great value in reference to the urinary secretion in diabetes, as it is mainly by ascertaining whether the daily amount of excreted glucose is diminishing or increasing that we can trace the favourable or unfavourable progress of the case.

Without entering into details, we may mention that there are three different modes of determining the amount of glucose in a fluid: the first is by determining the specific gravity; the second is the optical test, which is based upon the fact (already noticed), that solutions of sugar (whether grape, cane, or milk sugar) exert right-handed rotation upon a ray of polarised light, the angle of rotation being proportional to the percentage of sugar. Soleil's apparatus for determining sugar in this way is described in the article Polarising Apparatus. The third is by chemical means, of which the most important are Barreswil's method and the fermentation test. Barreswil's method is based upon the property which glucose possesses of throwing down suboxide of copper from alkaline solutions of oxide of copper.

In employing the products of the fermentation of glucose as a means of determining its quantity, we take a given quantity of the saccharine fluid, add a little well-washed yeast, and collect the carbonic acid that is evolved over mercury. Roughly speaking, a cubic inch of carbonic acid corresponds to a grain of sugar.

Much information upon the different tests for glucose, and upon their relative degrees of delicacy, will be found in a paper recently published by Dr Bence Jones in the *Quarterly Journal of the Chemical Society*, 1861, vol. xiv. p. 22.

GLUCOSU'RIA, a modern name for Diabetes Mellitus (see Diabetes), and indicative of its characteristic symptom, the presence of sugar in the urine.

GLUE. See Gelatine.

GLUE, Marine, a cementing composition used in ship-building, and for other purposes, where the materials are exposed to the influence of wet. It consists of india-rubber cut very small—one part digested at a gentle heat in a closed vessel with twelve parts of mineral naphtha until it is dissolved, then twenty parts of powdered shell-lac are added, and the digestion continued until it also is dissolved. During both stages of the process, the mixture must be stirred or shaken occasionally. It requires to be liquefied by heat before using, and must be quickly applied, as it very soon hardens. It is particularly valuable in consequence of its power to cement not only wood, but glass and metals, and also to resist the action of moisture. Its employment, however, requires some care and skill.

GLUME, in Botany, a small bract or scale, in the axil of which there grows either a single flower destitute of perianth, as in the *Cyperaceæ*, and in some of the Grasses; or, as in others of the Grasses, a *spikelet* composed of a number of flowers (*florets*). The Grasses (*Gramineæ*) and *Cyperaceæ* are sometimes conjoined under the appellation *Glumaceous Plants.*

GLU'TEN is one of the most important constituents of the varieties of corn used as food. It is obtained by mixing flour with water, and thus forming a paste or dough. This paste is placed in a bag of fine linen, and kneaded in water, which must be repeatedly changed, till it ceases to assume a milky appearance. A gray, tenacious, viscous, tasteless substance, having the appearance of birdlime, is left in the bag. This substance consists mainly of gluten, mixed with traces of bran starch and of oily matter. The gluten thus obtained from wheat and from rye is far more tenacious than that which is obtained from the other cereals, and it is the great tenacity of this constituent that especially fits these flours for conversion into bread. It is found by analysis, that the proportion of gluten contained in wheat grown in Algeria and other hot countries is considerably higher than in wheat grown in England, or still colder countries; and the hard, thin-skinned wheats contain more of this ingredient than the softer varieties of the grain. It forms about 16 per cent. of Algerian wheat; about 15 per cent. of wheat from the Black Sea; and nearly 14 per cent. of South Carolina wheat; about 10·7 per cent. of English wheat; 9·8 per cent. of Canadian wheat; and less than 9 per cent. of Danzig wheat.

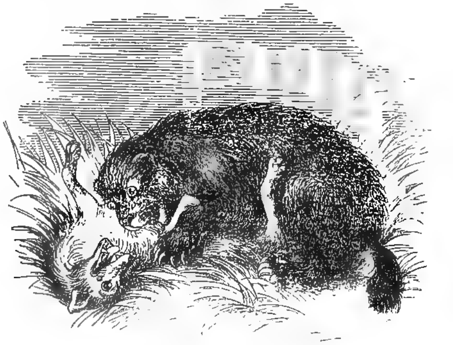
Gluten in a moist state rapidly putrefies, the mass acquiring the smell of decaying cheese; but when dry, it forms a hard, brownish, horny-looking mass, that does not very readily decompose. On treating gluten with hot alcohol, we find that it resolves itself into at least two distinct substances, one of which is soluble, and the other insoluble in that fluid.

The insoluble portion is regarded by Liebig as vegetable fibrine. It is a gray, tough, elastic substance, insoluble in water or in ether, but readily soluble in dilute alkalies, from which it is precipitated by neutralisation with acetic acid. It is also soluble in very dilute hydrochloric acid, from which it is thrown down by the neutral salts.

The soluble portion is in part precipitated from the alcohol on cooling, in the form of flakes, which have the composition and properties of caseine; while a third substance remains in solution, giving to the alcohol a sirupy consistence. It separates, on the addition of water, as a white substance resembling albumen. It is usually known as *gliadin*, but some chemists—Dumas and Cahours, and others—have termed it *glutin*, a name which is objectionable on the ground that it is already engaged for the chief form of gelatine. All these constituents of gluten contain carbon, hydrogen, nitrogen, oxygen, and sulphur, in much the same proportion as the animal albuminates or proteine bodies, and they all doubtless belong to the flesh-forming group of foods.

The action of gluten in the manufacture of bread is probably a double one; it induces, by constant action, an alteration of the starch, and subsequent fermentation, while by its tenacity it prevents the escape of carbonic acid gas.

GLU'TTON (*Gulo*), a genus of quadrupeds usually referred to the bear family (*Ursidæ*), but which constitutes an interesting connecting-link between that and the weasel family (*Mustelidæ*), agreeing more nearly with the latter in dentition, although approaching to the former in the plantigrade character. There are three false molars in the upper, and four in the lower jaw, anterior to the carnivorous tooth, which is large and sharp. The body is long, the legs are short, the feet have each five deeply divided toes, terminated by long curved claws. The tail is rather short, a fold beneath the tail supplies the place of the glandular pouch of the badgers; but when hard pressed by enemies, the gluttons emit a peculiar fluid of a strong musky odour. Their habits are nocturnal. The species commonly called **Glutton**, and also **Wolverene** (*G. arcticus*), is a native of the northern parts of Europe, Asia, and America. It is more common in the arctic regions than towards the southern limits of its distribution, which are about the forests of Courland, in Europe, and the mountainous parts of Massachusetts, in America. It is about two feet six inches or two feet nine inches in length, from the tip of the nose to the root of the tail; the tail about seven or eight inches long, both body and tail covered with long hair, under which the body is covered with a rich thick fur. The general colour of the long hair is brown, sometimes approaching to black, lighter bands passing from the neck along the flanks, and meeting at the tail. The short fur is chestnut brown. The muzzle is black. A light-brown band runs across the forehead from ear to ear. The fur of the G. is sometimes of considerable value, and is used for muffs, cloaks, &c., but varies not a little in glossiness and other qualities. The most extraordinary stories were at one time credited concerning the ferocity, voracity, and cunning of this animal, and have not altogether disappeared from books of natural history. It is very capable of domestication, and even in a wild state exhibits no remarkable ferocity; nor is there any reason to believe that it leaps from trees on deer, or pursues any of those artful methods of procuring food which were once ascribed to it. It often preys on animals which it has not itself killed. The smaller quadrupeds are its principal food, and it devours young foxes in great numbers. Its speed is not great, but it excels in strength and perseverance. The traps set for the smaller kinds of animals in the fur countries of North America are very often robbed by the wolverene, and it has been known to remove a great pile of wood, in order to get at provisions which had been hidden under it.—Closely allied to the G. are the Grison and the Ratel. Bone-caverns and some of the newest deposits exhibit remains of more than one species of Glutton.



Glutton (*Gulo arcticus*).

GLYCE'RIA. See Manna Grass.

GLY'CERINE ($C_6H_8O_6$), known also as hydrated oxide of lipyl, or hydrated oxide of glyceryl, was discovered by Scheele in 1779, who obtained it in the preparation of lead-plaster, and named it 'the sweet principle of oils.' It is a colourless, viscid, neutral, uncrystallisable, inodorous fluid, of a sweet taste, is soluble in water and alcohol in all proportions, but is nearly insoluble in ether. Its specific gravity at 59° is, according to Miller and most authorities, 1·28, but Gorup-Besanaz makes it as high as 1·97. At 40°, it becomes gummy and almost solid; at 212°, it is slightly volatile; but if distilled alone, the greater part of it becomes decomposed; it may, however, be distilled without alteration in a current of superheated steam which has been raised to a temperature of between 500° and 600°. By this means, Mr Wilson* has succeeded in separating heated fats into hydrated glycerine, and the acids with which it was previously in combination; the glycerine is thus obtained in a high state of concentration as a colourless, syrupy liquid, which can be thus prepared in unlimited quantity.

Glycerine forms soluble compounds with baryta, strontia, and lime; and it dissolves oxide of lead and numerous salts. Berthollet has found that glycerine, like Mannite (q. v.), is convertible into a true fermentable sugar, when digested with certain animal tissues.

Glycerine occurs ready formed in a few fats (as, for example, old palm-oil), and, according to Pasteur, is contained in all fermented liquors, and especially in wine, its quantity amounting to three per cent. of the fermented sugar. It is a product of the saponification of the various fats, although it does not exist as glycerine, but rather as a substance having the composition represented by the formula $C_6H_5O_3$. According to Berthollet's view, glycerine is a triatomic alcohol, and may be represented by the formula $C_6H_5O_3,3HO$; and in the animal and in many vegetable fats, the three atoms of water are replaced by three atoms of the anhydrous fatty acid. Thus—

$$\text{Stearine} = C_6H_5O_3 + \overbrace{3C_{36}H_{35}O_3}^{\text{Stearic Acid.}},$$

$$\text{Palmitine} = C_6H_5O_3 + \overbrace{3C_{32}H_{31}O_3}^{\text{Palmitic Acid.}},$$

$$\text{and Oleine} = C_6H_5O_3 + \overbrace{3C_{36}H_{33}O_3}^{\text{Oleic Acid.}}.$$

In the saponification of these fats—that is to say, when they are treated with potash, soda, or oxide of lead, or under the influence of heated steam—the fatty acid separates from $C_6H_5O_3$, which assimilates three atoms of water, and becomes glycerine.

We have already referred to the best mode (Wilson's process) of obtaining glycerine on a large scale; the usual method of obtaining it on a small scale is from olive oil, which we saponify by treating it with an equal weight of oxide of lead (litharge), which is mixed with water, and added to the oil, with which it is boiled till the saponification is complete. The glycerine is dissolved by the water, and is easily separated from the insoluble lead-plaster (a mixture of oleate and palmitate of lead). Any traces of lead are removed by sulphuretted hydrogen, and the water is then expelled *in vacuo*, or over the water-bath. The former is preferable, as in the open air the glycerine becomes brown.

The uses of glycerine are numerous. In medicine, it is employed as a local application in diseases of the skin and of the ear; and it is used internally as a solvent for many drugs. It is a valuable preservative fluid for small and delicate anatomical preparations, and it has been applied to the preservation of meat. It has been added to the water in gas-meters, with the view of preventing it from freezing in winter, or from evaporating too rapidly in summer. It is used in the manufacture of copying-ink, and is of general application wherever a lubricating agent is required.

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* The chemical superintendent at the works of Price's Patent Candle Company.

Many interesting researches have been carried on during the last few years regarding the true chemical nature and the artificial production of glycerine; they are, however, for the most part of a too purely chemical nature to be made intelligible to the general reader. We will merely remark that, like the alcohols in general, to which class glycerine is now assigned, it forms several classes or series of derivatives, the most important of which are its combinations with acids, forming *glycerides*, or compound ethers of glycerine, which are analogous in their composition to the various fats and oils. Berthollet has succeeded in forming these bodies synthetically, and has thus not only reproduced several of the natural fats, but has obtained a large class of similar bodies which were not previously known.

Treated with sulphuric acid, glycerine yields *sulphoglyceric acid* ($C_6H_8O_6,2SO_3$), and treated with phosphoric acid, it yields *phosphoglyceric acid* ($C_6H_8O_6,PO_5,HO$), a substance which occurs normally, in combination with soda and ammonia, in the brain and in the yolk of egg.

GLY'CINE, GLY'COCINE, GLY'COCOLL, or **SUGAR OF GELATINE** ($C_4H_5NO_4$), occurs in colourless, transparent, rhombic prisms, which have a sweet taste, and are devoid of odour. It is very soluble in water, the solution having no effect on vegetable colours, but is insoluble in alcohol and in ether. Glycine combines both with acids (as hydrochloric, nitric, sulphuric, and oxalic acid) and with metallic oxides, and the compounds in both cases are soluble and crystallisable; they are, however, of no great importance.

It is usually described as an animal base, but some chemists regard it as belonging to the class of bodies termed amido-acids, and as being amido-acetic acid; that is to say, acetic acid ($C_4H_4O_4$) in which one of the atoms of hydrogen is replaced by one atom of amidogen (NH_2). According to this view, its formula should be written $C_4H_3(NH_2)O_4$. Glycine is a product of various processes of decomposition of animal matters.

GLY'COGEN ($C_{12}H_{11}O_{11},HO$, according to the analysis of Pelouze) is a substance which in its properties seems intermediate between starch and dextrine. In contact with saliva, pancreatic juice, diastase, or with the blood or parenchyma of the liver, it is converted into glycose, and hence its name of glycogen. It occurs only in the cells of the liver, where it exists as an amorphous matter; but in the early stage of fœtal life, before the liver begins to discharge its functions, instead of being found in that organ, it exists in special cells in the fœtal structures known as the placenta and the amnion, and in the muscles, horny tissues, &c. In severe forms of disease, and especially in febrile affections, it seems to be temporarily absent from the liver. Its uses in the animal economy are noticed in the article LIVER.

GLYCOL is the type of a new class of artificial compounds, whose existence was inferred, and afterwards discovered, a few years ago, by Wurtz. In their chemical relation and properties, they form an intermediate series between the monobasic or monatomic alcohols, of which common alcohol is the type on the one hand, and the class of bodies of which ordinary glycerine is the type, on the other. The name of glycol, formed from the first syllable of glycerine and the last of alcohol, has been given to express this relation. According to the Theory of Types which is now commonly accepted (see TYPES, THEORY OF CHEMICAL), the glycols are termed diatomic alcohols, ordinary alcohol being a monatomic, and glycerine being a triatomic alcohol.

Ordinary glycol is formed from ethylene (C_4H_4), and hence it may be called ethyl-glycol, to distinguish it from propyl-glycol, which is formed from propylene (C_6H_6), from butyl-glycol, which is formed from butylene (C_8H_8), or from amyl-glycol, which is formed from amylene ($C_{10}H_{10}$).

Glycol is a colourless, slightly viscid fluid, with a sweet taste, and its composition is expressed by the formula $C_4H_6O_4$. For further information on this class of bodies, we must refer to any of the recent works on organic chemistry, or to a lecture on the *Histoire générale des Glycols*, delivered by Wurtz before the Chemical Society of Paris, and published in the *Leçons de Chimie professées en* 1860, par MM. Pasteur, Cahours, Wurtz, &c., 1861.

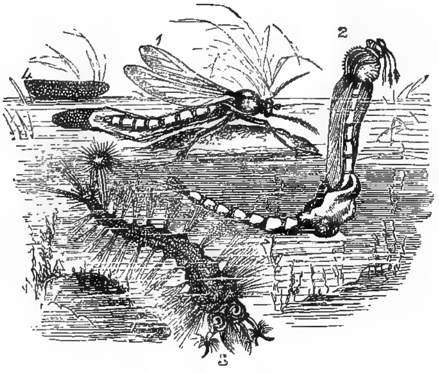
GLYCO'SMIS, a genus of plants of the natural order *Aurantiaceæ*, trees, natives of the East Indies and the Mascarene Islands. The fruit of *G. citrifolia*, an East Indian species, is delicious.

GMELIN, LEOPOLD, a celebrated chemist, was born at Göttingen, in August 1788, and died at Heidelberg, in April 1853. His father was professor of natural history and botany at Tübingen, and afterwards of chemistry at Göttingen; and for at least four generations members of the Gmelin family have distinguished themselves in chemistry and natural history. After taking his degree in medicine, he spent several years at Tübingen, Vienna, and Naples, in the study of chemistry and mineralogy; and in the autumn of 1813, he began his public career as a teacher of chemistry at Heidelberg, where, twelve months afterwards, he was appointed extraordinary professor of chemistry. He discharged the duties of his office with unremitting zeal until 1848, when he had an attack of paralysis; and in 1850, in consequence of a second attack, he was obliged to resign his professorial office. He published numerous contributions to chemistry and mineralogy in Schweigger's *Journal*, Poggendorff's *Annalen*, Liebig's *Annalen*, and in Leonhard's *Jahrbuch*, between the years 1815 and 1844. In 1820, he undertook, in conjunction with Tiedemann, a series of experiments on digestion; and in 1826, these philosophers published their celebrated work on this subject, under the title of *Die Verdauung nach Versuchen*, in two volumes. 'But' (Report of the Council of the Chemical Society for 1854) 'the greatest service which Gmelin rendered to science—a service in which he surpassed all his predecessors and all his contemporaries—consists in this: that he collected and arranged in order all the facts that have been discovered in connection with chemistry. His *Handbuch der Chemie* stands alone. Other writers on chemistry have indeed arranged large quantities of materials in systematic order, but for completeness and fidelity of collation, and consecutiveness of arrangement, Gmelin's *Handbook* is unrivalled.' The first edition of this great work appeared in 1817—1819, and included, in two vols. of moderate size, the whole extent of chemical knowledge as it then existed. The fourth and last appeared between the years 1843 and 1855, and extended to six vols., the last volume being edited, after G.'s death, by Schlossberger and List. An English translation of this edition (under the auspices of the Cavendish Society), with important additions by Mr Watts, the translator, is now in course of publication, and nearly completed.

GMUND, a town of Würtemberg, in the circle of Jaxt, stands in a beautiful and highly cultivated district on the Rems, 29 miles east-north-east from Stuttgart. G. has important manufactures of *bijouterie* and hardware, and carries on spinning and stocking-weaving. Hops are produced in the neighbourhood in great quantity. G. was formerly an imperial free city, and in the middle ages had a population of 18,000. It was added to the kingdom of Würtemberg in 1803. Pop. 6267.

GNAPHA'LIUM. See Cudweed.

GNAT (*Culex*), a genus of dipterous insects, having the wings laid flat on the back when at rest; the antennæ thread-like, 14-jointed, feathery in the male, and hairy in the female; the mouth furnished with a long projecting proboscis, adapted for piercing the skin of animals and sucking their blood. They are said to feed also on vegetable juices. The species are numerous, and abound in almost all parts of the world, particularly in marshy regions; and some of them, under the name of Mosquitoes (q. v.), are known in many countries as most annoying pests. An irritating fluid, injected through the proboscis, makes their punctures painful, and causes swelling. The proboscis of a gnat is an extremely interesting microscopical object. It is a membranous cylindrical tube, clothed with minute, feather-like scales, and terminated by two lips, which, when closed, form a kind of knob, and by six sharp bristles or very small lancets. The female gnats have the most powerful proboscis, and are the principal blood-suckers. Some persons are much more liable to the assaults of gnats than others. The flight of gnats is very swift, and the extremely rapid vibration of their wings causes the loud and sharp buzzing sound, which so often prevents sleep when even one of these insects has found its way into a bedroom on a summer night. The eggs of gnats are deposited on the surface of shallow stagnant water, placed side by side, united by an unctuous matter, and fastened to the bottom by a thread, which prevents their floating away. They are soon hatched; indeed, a single summer sees several generations of gnats. The larvæ are to be seen in immense numbers in stagnant waters; they are of an elongated worm-like form; are destitute of feet, but swim and dive by means of fin-like organs; they feed on insects, and also on vegetable substances; and often suspend themselves at the surface of the water, head downwards, for the purpose of respiration, by means of radiating bristles attached to a long spiracle or tube at the caudal extremity of the body, by which air is admitted to the *tracheæ* or air-tubes. The pupæ also inhabit water, and are active; they remain almost constantly at the surface of the water, with the body recurved; and the respiratory openings of the air-tubes are now in the thorax.—The Common G. (*C. pipiens*) is of very wide geographic distribution. It is about three lines in length, brown, with whitish rings on the abdomen, the wings unspotted. It so abounds in some of the fenny parts of England that beds are occasionally surrounded with gauze curtains, as in India on account of mosquitoes. It is extremely abundant in Lapland and Iceland.—A number of genera, allied to *Culex*, are united by many entomologists into a family called *Culicidæ*.



Gnat, magnified:
1, insect depositing eggs; 2, insect escaping from pupa case; 3, larva of gnat; 4, floating raft of eggs.

GNEISS, a term introduced from the German, as the name for a variety of Metamorphic rock, which has the same component materials as granite, and differs from it only in these materials being arranged in layers, rather than in an apparently confused aggregated mass. The minerals of which it is composed are quartz, felspar, and mica. The mica is sometimes replaced by hornblende, producing a gneiss corresponding to the variety of granite called Syenite. The different ingredients occur in various proportions, altering the character and appearance of the gneiss accordingly. It is often difficult to determine hand specimens of gneiss; for, on the one hand, they are sometimes so crystalline that they resemble granite, while, on the other, the schistose varieties approach so near to mica-schist, that even in the field, under the most favourable circumstances, it is not easy positively to separate them.

Gneiss was originally deposited as sand or mud, and has been converted into a hard tough crystalline rock by long and continuous subjection to metamorphic action, induced, perhaps, chiefly by heat. It has generally been considered as an azoic rock, that is, deposited before the existence of life on the globe. The older strata, classified by Logan under the title Laurentian, the equivalents of which have been recently observed by Murchison in Scotland, have as yet proved destitute of fossils, but this may be owing to the extreme metamorphism they have undergone. The Cambrian and Silurian strata of the north of Scotland have also been to a large extent converted into gneissose rocks, which contain intercalated with them fossiliferous limestones. It would seem, indeed, that gneiss and its allied stratified rocks are not necessarily 'primary rocks,' but may occur wherever an agency sufficiently powerful has acted upon ordinary sandstone and shale.

GNE'SEN, a small town of Prussia, is situated in a district abounding in hills and lakes, in the province of Posen, and thirty miles east-north-east of the town of that name. It was the earliest capital, and is said to be the oldest town of Poland. Pop. 7765.

GNETA'CEÆ. See Sea Grape.

GNOME (Gr. *gnome*), a pithy and sententious saying, commonly in verse, embodying some moral sentiment or precept. The gnome belongs to the same generic class with the proverb; but it differs from a proverb in wanting that common and popular acceptance which stamps the proverb, as it were, with public authority. The use of gnomes prevailed among all the early nations, especially the Orientals; and the literatures, both sacred and profane, of most countries abound with them. In the Bible, the book of Proverbs, part of Ecclesiastes, and still more the apocryphal book of Ecclesiasticus, present, so far as regards language and structure, numberless illustrations of the highest form of this composition. The other books of the Old

Testament contain many examples; and in the New Testament the familiar lessons of our Lord are frequently presented in this striking form, which was peculiarly adapted to impress and move the classes whom he addressed. The Indian, the Arabian, and the Persian literatures also are rich in gnomes, as are those of the northern nations. But the most interesting form which they have taken is that in which we find them in Greek literature, in which the writers who have cultivated this form of composition are known as a distinct class—the Gnomic Poets (*gnomikoi*). The Greek gnome is commonly couched in the elegiac distich; and the most celebrated gnomic poets were Solon, Theognis, Phocylides, Simonides, Tyrtæus, and Xenophanes of Colophon. The most remarkable of these is Theognis, whose gnomes extend to above 1200 lines. The remains of gnomic writers have been repeatedly edited under the title of *Gnomici Poetæ Græci*, from the days of Melancthon downwards. The standard editions are those of Bekker (1815) and Welcker (1826). There is, moreover, a popular edition by Brunck, which is reprinted in the Tauchnitz Classics; and the gnomic poets are also commonly included in the collections of Minor Greek Poets.

In Latin literature, the *Disticha* of Dionysius Cato, the authorship of which has proved so fertile a source of controversy, may be mentioned as belonging to the class of gnomes.

GNOME, the name given in the cabalistic and mediæval mythology to one of the classes of imaginary beings which are supposed to be the presiding spirits in the mysterious operations of nature in the mineral and vegetable world. They have their dwelling within the earth, where they preside specially over its treasures, and are of both sexes, male and female. The former are often represented in the form of misshapen dwarfs, of whom the well-known 'Rübezahl,' or 'Number-nip,' of German legend is a familiar example. Pope, in the *Rape of the Lock*, and Darwin, in the *Loves of the Plants*, have drawn upon the more pleasing associations of this curious branch of mythology. See ELEMENTAL SPIRITS.

GNO'MON. When a rectangle is divided into four parts by cross lines parallel to its sides, the sum of any three of the parts is called the *gnomon*. See Euclid, b. ii. prop. 5, and seq.—Gnomon has also a meaning in Dialling (q. v.).

GNOMO'NIC PROJECTION. See PROJECTIONS.

GNO'STICS (from Gr. *Gnōsis*, knowledge), the collective term for a number of early Christian sects which were known besides—with one insignificant exception—by special names derived from their respective founders. The word gnosis, when first applied to revealed religion, in many passages both of the Septuagint (for the Hebr. *Dêah*) and the New Testament, expressed a full and comprehensive acquaintance with, and insight into, the received laws and tenets, ritual and ethical, and was consequently praised as a desirable acquirement; by St Paul even called a special gift (*Charisma*) (1 Cor. xii. 8, &c.). Gradually, however, there was—first by the Judæo-Alexandrine schools—ingrafted upon it a meaning more akin to that in which it was occasionally used by Pythagoras and Plato; it designated a knowledge of certain mysteries, which lay hidden beneath the letter of the religious records, and could be received only by a few superior minds, while the multitude had to be satisfied with the outward apparent meaning. The remarkable form of Christianity to which the word in this sense was applied, is a religious phenomenon as extraordinary as were the times and causes that gave it birth. Rome had conquered well-nigh the whole of the then known civilised world, and within her vast dominions the barriers, which had hitherto separated the multifarious nations of east and west, were broken down. From the remotest corners of the empire philosophers and priests, scholars and teachers, flocked to Rome, to Athens, to Alexandria, and communicated to each other, discussed, and frequently amalgamated their widely differing creeds and systems to such a degree that the former national or personal individuality of opinion was almost effaced, making room either for a vacillating indecision, or at the best a shadowy and passive eclecticism. And while, on the one hand, Greek philosophy, which formed a principal part of the education of the higher classes, had become almost exclusively a Platonism, sliding into overt scepticism; on the other hand, the naturalisation in the Roman empire of a promiscuous Pantheon, whose gods were gathered from Egypt, Greece, Persia, India, and countries still more remote, had at length produced, out of an unparalleled mixture of religious ideas and fancies, a superstition so abject and unnatural, that it too, at last, was ready to give place to despairing unbelief. Judaism, again, had outlived its political existence, and began to assert itself as a faith, independent of any state or dominion of its own, divided, however, into different schools, according to the more or less strict adherence to the letter of its written and oral laws. Nay, the influence of Hellenism had, among the Alexandrines, produced such effect that, of the living body of Judaism, little remained but a skeleton framework, round which allegory and symbol had woven their fantastic fabric. Christianity, as yet not clearly defined, swept all the more irresistibly over the regions from the Euphrates to the Ganges, the Nile to the Tiber, as it offered a code of morals sublime and yet simple, a faith human and withal divine, superior to any of the abstruse and exploded Polytheisms, to a world agitated to its lowest depths, and yearning for some new and more satisfying doctrine; while, at the same time, it denounced the stringent and severe ritual tenets of its mother-religion, Judaism, as inconsistent with the freedom of the human mind. Yet it was not to be expected that the old pagan creeds and the old philosophies would expire without a struggle. They made a last stand, and produced in their and the ancient world's dying hour Gnosticism. It sprang suddenly out of a monstrous chaos, a consummate religious eclecticism, bold, consistent, to a certain degree even sublime. The wildly opposite ideas of Polytheism, Pantheism, Monotheism, the most recondite philosophical systems of Aristotle, Plato, Pythagoras, Heraclitus, Empedocles, &c., together with the awe-striking Mysticism and Demonology which after the Babylonian captivity had created, in the very heart of Judaism, that stupendous and pre-eminently anti-Jewish science of Cabbala (q. v.)—all, it would appear, had waited to add something of their own to the new faith, which could not hold its own under all these strange influences. An open attack was no longer of any use; so, assuming the garb of the enemy, they sought to carry destruction into the centre of the hostile camp. Moreover, an aristocracy of mind, powerful and numerous as none had ever been before, could not but, even when it had outwardly assumed the new religion, loathe the thought of sharing it completely and unreservedly with the herd of freed and unfreed slaves around them, with the low and the poor in spirit; and the exclusiveness of Gnosticism was undoubtedly, next to the fascination of its dogmas, one of the chief reasons of its extraordinarily rapid propagation.

We have stated at the outset, that Gnosticism was but a general name for a great number of diverging Christian schools. But all these had some fundamental points in common, which we will attempt to specify briefly, as far as the fragmentary and adulterated nature of the evidence will permit; for unluckily, all we know of the G., we know from their Jewish and Christian adversaries, who confessedly took especial pride in representing them and their belief in their darkest hues.

There is a Divine Being, whose essence is love, grace, and mercy. He is enthroned in the highest height, enclosed in an abyss (*Buthos*). He is the sum of being, He is silence, abstraction, incomprehensible, for human minds almost non-existing (*Ouk On*). The Mosaic Cosmogony has not seemingly, they said, brought us one step nearer to the solution of the problem of the creation. Out of nothing, nothing can come, notwithstanding a Divine Fiat; for God can, through his spiritual nature, have no connection whatever with corporeal things, and he could not have originally *made* them. They, therefore, assumed a pre-existing *matter* (*Hyle*), out of which the universe was merely *formed*. A corroboration for this opinion was found—according to the peculiar Gnostic mode of interpretation—in the two adjectives *Tohu vabohu* (without form and void) (Gen. i. 2), applied to the earth, and which were by them interpreted as substantives (Kenoma, Kenon) intended to express the original substance of the universe (Cf. Gen. Rab. i.). Between this Hyle, or visible world, however, which was either represented as the darkness or shadow alongside the divine light, as a sluggish, stagnant mass, or as a turbulent, active kingdom of evil; and that supreme incomprehensible Being, whose goodness could have nothing to do with the evils of the world, no more than his perfection with its defects and misery, there existed a *Plerōma*, or fulness of Light. In this fulness dwelt embodied attributes of Divinity, the abstract ideas of Wisdom, Justice, Right, Power, Truth, Peace, and many more which had emanated or flowed out (in pairs, as some held, male and female) from the supreme central point, as rays innumerable flow out of the sun, as countless numbers from one unit, as echoes from a sound, or as, primarily, all the founts and rivers arise from the waters below. At the head of these emanations or Æons (Everlasting ones—like their source) which, descending lower and lower, form a link between heaven and earth, stands the Nous; and one of the lowest Æons is the *Demiurgos*. He is the real framer and master of the visible world, and partakes to a certain degree of its nature. On the nature of this Demiurgos (Jaldabaoth, Archon), however, the two principal divisions of Gnosticism, which might be termed Judæo-Alexandrine and Syrian respectively, widely differed. The former took him as the representative and organ of the highest God. It was he who had been put by the divine will over Israel, especially under the name of Jehovah. As other, though inferior, angels presided over the destinies of other nations, so this higher Æon had to protect the peculiar people of God. It was he, therefore, who revealed himself—he who gave the laws—he who sent the prophets. But in all this he acted rather as an unconscious medium; he was no more able to comprehend the full meaning of the ideas revealed through him in the Old Testament, than he understood the scope and significance of the creation. His principal attributes are justice and severity, which, carried out with stern consistency, become cruelty. These G. distinguished also among the Jews themselves, those 'after the flesh' who, confounding the likeness with the original, the symbol with the idea, took the Demiurgos to be the supreme God, and those 'after the Spirit,' or Israelites indeed—the privileged few who, divining at least the veiled ideas of the supreme God, needed no such education by fear or hope, punishment or reward, at the hands of the Demiurgos, but rose above him in understanding and conception of things human and divine. The other principal party of the G., however, the Syrian, under the influence of the Parsic (Zoroastrian) Dualism, so far from considering the Demiurgos as an instrument of divinity, willing but poor in intellect, looked upon him rather as a rival, and consequently conflicting power. He is the primary evil opposed to the primary good. The divine germs which, according to both parties, had been communicated through the lowest emanations in their downward course to matter and to mankind, the Demiurgos of the Alexandrians had not known how to develop in a proper manner, but had weakened, sometimes neutralised them from want of knowledge, thus engendering all earthly sin and misery *against* his will, while the Syrian Demiurge spitefully and maliciously stifled these germs in order to wrest the power over the world from the Divine Being altogether. His base, revengeful, and withal limited nature, they said, is fully and clearly stamped upon the Old Testament—exclusively his work.

Man—in this all the schools were agreed—was divided into three classes, corresponding more or less to these predominant powers of the world: Divinity, Matter, and Demiurgos. There were first the spiritual men or *Pneumatikoi*, inspired by the highest God, striving towards him, with him; initiated into his counsels, understanding his essence. They were free from the yoke of law, for terrestrial nature had no power over them; they were the prophets, guiding, but not guided; the possessors of the true Gnosis. Diametrically opposed to these, as was Hyle to divinity, are the terrestrial men, *Sarkikoi* or *Choiks*—of the earth earthy—who are tied and bound by matter; they can neither aspire to the height of spiritual men, nor are they to be ruled by the precepts of law. Between these stand the *Psychikoi*, the blind servants of the lawgiving Demiurgos, who are, through the restraints put upon them by his either stupid or spiteful precepts, free to a certain degree from the terrestrial powers, but they can never reach the height in which the pneumatics habitually dwell. And again, corresponding to these three classes of men, there were three principal religions; Christianity above, Heathenism below, Judaism in the intermediate space.

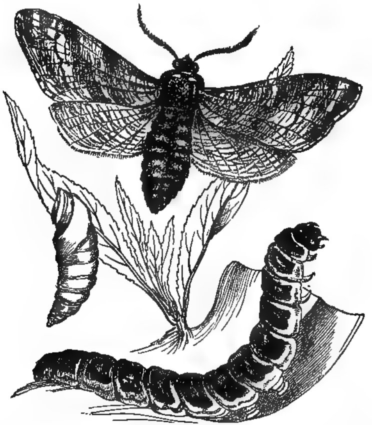
The two leading tendencies of Gnosticism, of which we have spoken, also manifested themselves, accordingly, in the view they each took of the person of Christ himself. According to both, he was the highest Æon, suddenly sent down by the Supreme Being, to rescue and reclaim certain higher natures—for the lowest stratum of men, the carnal or terrestrial, was irredeemably lost—which had either been led astray by the Demiurgos, or had become entangled in the net of matter. At the same time the harmonious combination of the human and divine in Christ, which the New Testament assumed, stood in direct opposition to the very basis of Gnosticism. The Visible and the Invisible, the Finite and the Infinite, God and Man, cannot combine: in this they all agreed. But while the Judaising schools divided Christ into two distinct persons, one of heaven and one of earth, who had only become one at the baptism in the Jordan, and who had separated at the crucifixion; the other oriental section of Gnostics held that Christ's earthly manifestation in the flesh, that his whole humanity, was a mere shadow or delusion.

It might well be asked how, with this extraordinary conglomeration of Monotheism, Pantheism, Spiritualism and Materialism, the G. could possibly take their stand on the Bible, which, from first to last, it would seem, denounces, and in the strongest manner, doctrines such as the foregoing. The only answer to this is, that they, and they only, were the Pneumatikoi—the Initiated. It was well for the other portions of mankind, the natural men, to take everything, including Scripture, and its historical as well as its dogmatical parts, literally. As in creation, so in the book; the G., guided by their inner lights, saw beneath the surface, and saw everywhere, the most complete affirmation of their peculiar ideas. If the Midrash (q. v.) gave the most fanciful and allegorical interpretations of the Old Testament, for the sake of inculcating moral principles, for edifying, elevating, comforting the congregation, but without the faintest pretence that any but the fixed traditional interpretation was binding and authoritative—Gnosticism, with a proud contempt of the laws of language and thought, did the same for its own purposes, but made its wildly symbolical and erratic interpretations of the religious records binding. We are far from saying that they were in all cases guilty of intentional deception, in the ordinary sense of the word; although they must frequently have known the real meaning to be totally opposed to their explanations, as most of their teachers were learned Jews; but they, like other enthusiasts, gradually lost the power of discriminating between that which was, and that which might be. Some, however, more consistent, assumed that Christ and his apostles had still been partially under the influence of the Demiurgos, and also that what they had taught, they had expressed in accordance with the blindness of those whom they addressed. Proceeding consistently, they by degrees excluded from the code most of the books of the New Testament, especially those in which there were distinct attacks against themselves; and substituted a number of other epistles and religious documents of their own in Greek and Syriac, such as the *Prophecies of Cain*, *Writings of Pachur*, *Psalms* by Valentinus and Bardesanes, *Gnostic Hymns* by Marcos, *Books of Adam*, *Enoch*, *Moseh*, *Eliah*, *Isajah*, &c., not to mention a host of writings by newly invented prophets of such peculiar names as Pachor, Barkor, Armagil, Barbelon, Balsamum, Lensiboras, &c. (Hier. ad Theod. iii. 6, &c.).

Practically, Gnosticism influenced the lives of its adherents in two totally distinct ways: according to the view they took of the nature and office of the Hyle and Demiurgos. The Hellenising Gnostics, striving to free themselves as much as in them lay from their stupid and degrading bonds, became ascetics, austere, rigid, and uncompromising. The oriental view, however, of the dualistic and antagonistic powers of light and darkness, good and evil, which was adopted by the other portion of the G., led them, on the other hand, to the practice of the grossest sensuality, in token, they said, of their utter contempt for matter, and still more for the Demiurgos—Body, and its enjoyments; everything terrestrial, in short, had as little to do with their mind, which was one with the Supreme Deity, as had matter with God. Transgression there was none, because there was no law; there could be no law for them who were better even than the angels—who were subject to none: a distortion of a dictum in the *Midrash*, that 'the law was not given to angels, but to mortal men,' and was therefore to be administered leniently. They, indeed, knew not how to express to the full their utter contempt for this Jewish Jehovah, or Demiurgos. There were others among them who called themselves after the serpent (*Ophites*), which by tempting Eve brought into the world the blessing of knowledge, and had thus become its greatest benefactor. Others took the name of *Cainites* (*Balamites*), contending that Cain had been the primeval representative of Gnosis, as opposed to the *Pistis*, or blind unreasoning faith of Abel, the representative of the *Psychikoi* (the Jews)—Seth being the type of the *Pneumatikoi.* Another class of similar tendencies styled themselves simply *Antitacts* (opponents to the Law), a name indicative of their readiness to take under their especial protection, not only all those persons condemned in the Biblical records, but all the offences prohibited in them.

It is as hopeless a task to follow the development of this metaphysical and unique abnormity called Gnosticism, of which we have attempted here to give a faint outline, through the bewildering maze of its ramifications from its beginning in history to its final disappearance, as it would be to fully trace its component parts to their original sources. It sprang up in the first c., it had spread over the whole civilised world in the second, and it was fiercely and unremittingly combated from the second to the sixth c. by Judaism, Platonism, Neo-Platonism, and, above all, by Christianity. With respect to the relation of the Gnostics to the orthodox church, however, we must observe that they all the while feigned a naive surprise at not being fully recognised as most faithful followers of Christianity, and members of the large Christian body. All they aspired to, they said, was to be allowed to form a small central circle within the large outer circle, to be a kind of theosophic community, consisting of the more advanced members of the church; indeed, they not only adhered, for the most part, to the outward forms of Christian worship, but occasionally even surpassed it in pomp and splendour. And such was the fascination Gnosticism exercised over the minds, that, had it not been for the innumerable schisms in its own camp, which prevented its alliance with the political power of the day, it would have stood its ground much longer. On its influence upon the Judaism of its time, as it is recognisable in many passages of contemporaneous Jewish literature; on its lasting influence upon Christianity; and on its frequent revivals in the middle and modern centuries, we can as little dwell here as on its embodiment in many philosophical systems, ancient and modern.

We can only take, in conclusion, a cursory glance over some of its principal schools, in giving a brief list of their founders (of whom, and their chief doctrines, special notices will be found), and the places where they flourished, without attempting to divide them minutely, as has been done in different ways, by Neander, Gieseler, Matter, Baur, Schaff, into Judaising and Christianising; speculative, practical and antinomian; dualistic and emanationistic; or to classify them strictly by origin and locality. Suffice it to mention, that among the precursors of Gnosticism are recorded some half-mythical personages, such as Euphrates, mentioned cursorily by Origen; Simon Magus, whose history, as given in the Acts, has been made the groundwork of innumerable legends; Menander, his successor; Cerinthus, the apostle of the Millennium; and Nicolaus, the father of the pre-eminently immoral sect of the Nicolaitans. Founders of special schools were, in Syria, Saturninus of Antioch, about 125 A.D. under Hadrian; Bardesanes of Edessa, 161 A.D., the author of many hymns, and who looked colour, the upper wings mottled with white, and marked with many irregular black lines, the lower wings of an almost uniform brownish ash colour.



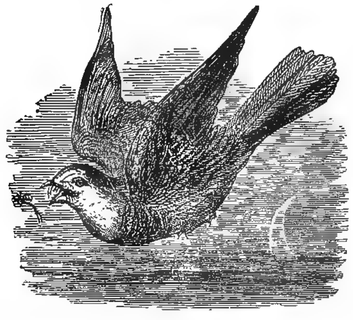
Caterpillar, Chrysalis, and Imago of the Goat-Moth (*Cossus ligniperda*).

The larva is about 3 inches long when full grown, yellowish, the upper parts pink, the head black. The larva inhabits and feeds on the wood of willows, poplars, and elms, making holes large enough to admit the finger, and often causing the destruction of trees. It emits, when alarmed or handled, a peculiar and disagreeable goat-like odour, which cannot be removed from the hands even by frequent washings.

GOAT'S-BEARD. See Salsafy.

GOAT'S RUE (*Galega*), a genus of plants of the natural order *Leguminosæ*, sub-order *Papilionaceæ*, of which one species (*G. officinalis*), a perennial herbaceous plant, about three feet in height, with pinnate leaves, long pointed leaflets, racemes of generally purplish or pink-coloured flowers, and upright nearly cylindrical pods, has been recommended for cultivation in Britain as a forage plant, on account of the great bulk of produce which it yields. It has, however, a peculiar smell, and is not relished by cattle unaccustomed to it. It is a native of the south of Europe.

GOA'TSUCKER (*Caprimulgus*), a genus of birds of the family *Caprimulgidæ* (q. v.), having the upper mandible curved at the point, and furnished along each margin with a row of strong hairs or bristles (*vibrissæ*) directed forwards; the hind toe capable of being directed forwards; the claws short, except that of the middle toe, which is remarkably long, and serrated on its inner edge, so as to form a kind of comb attached to the toe. Although the bill is very short and weak, the gape is extremely wide, as if the head itself were divided. The goatsuckers feed on insects, perhaps chiefly on moths, whence they are called *Moth-hunters*, and pursue their prey either in the evening twilight or during the night, in a manner similar to bats and swallows. Like them, they seem to confine themselves very much to a limited space, in which they often pass and repass at no great height above the ground. They have great rapidity and power of flight. Of course, their great width of gape is favourable for the capture of insects. Goatsuckers are birds of light, soft plumage, in general minutely mottled with gray and brown. One species alone is found in Britain, the Common G. or European G. (*C. Europæus*), also called the Night-Churr, or Night-Jar, from the sound which it produces; and not unfrequently, from the resemblance of its plumage to that of owls, the Churn Owl or Fern Owl. It is a summer visitant of Britain, coming very late, and departing generally very early; it is more common in England than in Scotland, although its migrations extend northward to Scandinavia, Siberia, and Kamtchatka. In winter, it retires from Europe altogether, passing to the south of the Mediterranean. It often haunts bushy places and grounds covered with brake. It scarcely makes a nest, but deposits two eggs in a depression of the ground, under shelter of a bush. Its whole length is about ten inches and a half. This bird is the *Caprimulgus* of Pliny, the *Aigothelas* of Aristotle, both these names being exactly equivalent to the English G., and expressive of the ancient and long entertained popular notion, that this bird sucks the teats of goats, a notion probably founded on the habit—which, at all events, has been observed in some of this family—of hunting insects under the bellies of grazing cattle.—Species of this and closely allied genera are very widely distributed over the world.



Common Goatsucker (*Caprimulgus Europæus*).

GOBBE, or **VOANDZOU** (*Voandzeia subterranea*), an annual plant, allied to the kidney-bean, but of which the pod is thrust into the ground in the same manner as that of the Ground-nut (*Arachis hypogæa*, see Arachis), to ripen the seeds there. It is a native of the north-east of South America, and of some parts of the west of Africa. Its seeds are used as food, being wholesome and agreeable when boiled.

GO'BBO, GOBBIO, or **GOMBO.** See Hibiscus.

GO'BELINS. See Tapestry.

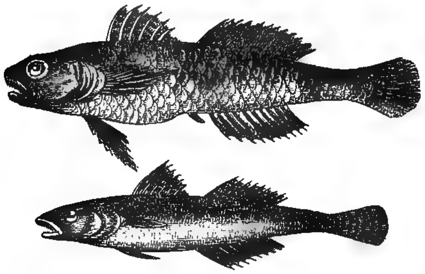
GOBI, Desert of. See Shamo.

GO'BLINS and **BOGLES**, familiar demons of popular superstition, in Fr. *gobelin*, Ger. *kobold*, Gr. *kobalos*, a spirit which lurks about houses. It is also called hobgoblin, perhaps a corruption of hopgoblin. Some have derived the word goblin from the French *gober*, to swallow, to devour; and others the words elf and goblin from the Guelphs and Ghibellines, each name being used by the other party as a name of terror. Goblin is used in a serious sense by Shakspeare in *Hamlet*, where the ghost is supposed to be a 'spirit of health or goblin damned.' *Gobelet*, in French, is applied to juggler's tricks and instruments, and our word goblet comes from the juggler's cup.

Bogle, bogle-boe, or bugaboo, may be from the Welsh *brogwly*, to terrify; and *boe* or *boo*, a sound. Bugaboo was the popular name of wide-mouthed, ugly pictures, formerly carried in May-games. Warton says Boh was the designation of a fierce Gothic chieftain, whose name was used in after-times to frighten children. The belief in benevolent and malevolent spirits belongs to all countries, and appears to be as old as the world.

GOBO'NY, in Heraldry, the same as *Componé* (q. v.). A gobonated bordure is frequently carried in place of the baton sinister, not only by the lawful issue of bastards, who, after the third lawful generation, are considered entitled to make the change, but by bastards themselves. See BASTARD BAR.

GOBY (*Gobius*), a genus of acanthopterous fishes, the type of the family *Gobiidæ*. This family is distinguished by the thinness and flexibility of the rays of the dorsal fin; by the union—in most of the genera—of the ventral fins, which are thoracic, into a disc more or less capable of being used as a sucker; by the want of an air-bladder; and by a long intestinal canal without cœca. The Blenny (q. v.) family (*Bleniidæ*) have by some ichthyologists been united with the Goby family, whilst others unite with them the *Discoboli* (q. v.). The true gobies (*Gobius*) are generally small fishes, some of them inhabiting the shallow water of the coasts, and others found in deeper water; the species very numerous, and found in the seas both of the northern and southern hemispheres. They are very interesting on account of their habits; and are of the number of nest-building fishes, employing *algæ* and grass-wrack (*Zostera marina*), in the spring season, for making their nests. When the female has deposited her eggs in the nest, the male watches over them till they are hatched. There are several British species, the largest of them—the BLACK GOBY (*G. niger*)—about five or six inches long, some of them pretty common on all parts of the coast, and much in request for aquaria, of which they are among the most interesting occupants. They are often found in rock-pools on the coast. The disc formed by the ventral fins is often used for adhesion to stones. Most of the gobies prefer seas of clayey or muddy bottom, in which they excavate canals to pass the winter in. The species are more numerous in the Mediterranean than in the British seas.—The Goby family includes the Dragonets (q. v.), and several other interesting genera, among which are the *Boleophthalmi* of the Chinese seas, remarkable for their power of thrusting out their eyes in order to look around them.



The Black Goby and the One-spotted Goby (*Gobius niger* and *Gobius unipunctatus*).

GOD (Lat. *Deus;* Gr. *Theos*), the self-existent and Supreme Being, creator and preserver of all things, and the object of human worship. The name is of Saxon origin. The idea is more or less definitely expressed in every language, as it may be said to be in some form or another a universal element of the human consciousness. There have been many nations, indeed, in every age of the world, that have been far from attaining any such conception of God as is expressed above. The Supreme has been to them the conception not of a single Being, but of many beings superior to man, and claiming his worship. In the general history of the world, polytheism precedes monotheism; the idea of many gods goes before the idea of one God, infinite and self-existent.

The general character of polytheism is everywhere the same.—A dualistic conception of nature and life underlies it, and shews itself in varied expressions. In looking forth on nature—in looking within himself—man seems to see two principles striving for the mastery—an active and passive, a creative and recipient principle—a good and evil, a productive and destructive, a joyous and gloomy agent. On one side, there seems a power rich, benignant, and gracious, giving light to the day, verdure to the spring, abundance in autumn, scattering fecundity and blessing around; on the other side, there seems a power cruel and malevolent, quenching the light in darkness, consuming the verdure and fertility with scorching heat, or destroying them with cold. These contrasts seem eternal—they take possession of the imagination, and clothe themselves in diverse shapes. In every polytheistic religion, they will be found in the recognition of male and female, of good and evil divinities—Baal and Baaltis, Baal-Adonis and Baal-Moloch, in the old Phœnician religion; Osiris and Isis and the evil principle, Typhon, in Egypt; and the more familiar opposites of Ahriman and Ormuzd, Jupiter and Juno, &c. The dualism assumes various shapes, now male and female, productive and passive; and now good and evil, conservative and destructive.

Whether this dualistic mode of conception, and the polytheistic view of nature that springs from it, be a later or an earlier type of thought than the monotheistic, has been a good deal disputed. Some see in it the corruption of monotheism—the worship of the Supreme gradually falling to a worship of the great forms of nature which most strikingly represent Him—the sun and storm, the light and darkness, &c. Others, again, regard the polytheistic as the primitive view of nature, above which man gradually rises, by the growth and exercise of his reason. There is truth in this latter view, even to those who believe that man originally received a Divine Revelation, which he has gradually corrupted. Polytheism is the natural religion of savage tribes throughout the world; and as man advances in civilisation, he rises to purer and more comprehensive conceptions of Deity. His reason compels him to recognise the One in the many everywhere, to carry up all his conceptions into a unity. Polytheism, consequently, everywhere disappears before the march of civilisation. It is incompatible with the lowest stage of speculative development.

But while the growth of reason and the rise of speculation everywhere destroy polytheism, they do not necessarily substitute a genuine monotheism —the doctrine, that is to say, of one living and true God, infinite in power, wisdom, goodness, and truth, a free personal Being exalted above the world, and apart from it, yet intimately related to all its creatures, who 'suffereth not a sparrow to fall to the ground without his permission.' This is the doctrine of Christian theism, as opposed alike to polytheism (the doctrine of many gods), pantheism (the doctrine that all things are God; that God is a unity, yet only a unity of comprehension, not a self-subsistent and independent unity), and atheism (the assertion that there is no God).

The course of argument on which the theistic conclusion supports itself may be sketched as follows: There are everywhere in the world the traces of order; a unity of plan or design, shewn in many beautiful effects, pervades creation. Science is always more unfolding it. Of *the fact* of this order or unity of plan, there is no question. The progress of science, if nothing else, has effectually exploded the old dualistic or polytheistic conception of nature. What appeared to be the result of opposing principles, is really found to be the issue of general laws working on some great although unexplored scheme of harmony. There is no disturbance, no *disorder;* amidst the infinite diversity of nature —*order* reigns universally.

But this 'order,' what is it? The mere recognition of order does not necessarily imply the recognition of God—of a 'Being all-powerful, wise, and good, by whom everything exists.' The materialist and pantheist equally admit the fact of order, but equally deny the theistic conclusion founded upon it; and the argument, accordingly, is carried up from nature and its facts to a higher region of discussion. Whence arises the conception of order—of design? Nature illustrates it, but nature does not itself give it. The general laws of which science speaks so much pervade all phenomena of creation, but they are not a part of these phenomena. 'Order' and law are ideas which *we* convey to nature, not which nature brings to us. They come from within, not from without. It is with mind, and not with matter that we start. The latter in itself presents a mere series of endless movements. It is in the presence of mind only that it assumes meaning and *order.* Mind is the true image of the Deity. We discern *causation* in nature, because we ourselves are *agents,* conscious of exerting power. We discern *order* in nature, because we everywhere bring our conceptions into a unity, and apprehend our several modes of consciousness with reference to the indivisible self which they all involve. 'In our life alone does nature live.' 'It is from the little world of our own consciousness, with its many objects marshalled in their array under the rule of the one conscious mind, that we are led to the thought of the great universe beyond—that we conceive this also as a world of order, and as being such by virtue of its relation to an ordering and presiding mind.'

The existence of Deity, therefore, is a postulate of the human consciousness. Recognise a living mind in man, independent of matter—a *rational will,* as constituting the essential and distinguishing element of his being—and the inference is inevitable of an infinite mind—a supreme will governing the world. A true natural theology is based upon a true psychology. A philosophy which denies to man a higher existence than nature, which would make his rational consciousness the mere growth of material conditions, leaves no ground of argument for the existence of Deity—for, as Jacobi says: 'Nature reveals only fate, only an indissoluble chain of causes (sequences), without beginning and without end, excluding with equal necessity both providence and chance. Working without will, she takes counsel neither of the good nor of the beautiful; creating nothing, she casts up from her dark abyss only eternal transformations of herself, unconsciously and without end. But man *reveals* God—for man, by his intelligence, rises above nature, and in virtue of this intelligence, is conscious of himself, as a power not only independent of, but opposed to, nature, and capable of resisting, conquering, and controlling her. As man has a living faith in this power superior to nature, which dwells in him, so has he belief in God—a feeling, an experience of his existence. As he does not believe in this power, so does he not believe in God; he sees, he experiences nought in existence but nature, and necessity, and fate.'

The argument for the existence of God rests, accordingly, on certain fundamental principles of our mental and moral being, such principles as causation and design, or final cause. It implies a spiritual philosophy of human nature. Apart from such a philosophy, theism has no argumentative basis, however it may prevail as a tradition or superstition.

But some philosophers have sought not merely to rest the argument for the existence of God upon such principles, but to evolve it in all its completeness from them alone. From a single datum of consciousness—sometimes from a single datum of experience—they have tried to construct, by processes of mere abstract reasoning, a 'demonstration of the being and attributes of God.' This has been styled the *à priori* method of argument, although to all the arguments to which this name has been given it does not strictly apply. The mode of argument, again, which reasons from special effects in nature to a First Cause, has been styled, in contradistinction, *à posteriori.* The argument from design, for example, as conducted by Paley and others, is *à posteriori.* The arguments of Descartes, and the 'demonstration' of Dr Samuel Clarke, are what have been termed *à priori.* Either of these modes of proof, taken by itself, has been rightly considered inconclusive by recent writers on natural theology. Mere *à priori* trains of reasoning fail to carry up the mind to any real and living conception of Deity; they yield merely a theoretical or abstract idea. Arguments such as Paley's and the Bridgewater treatises, again, are rather illustrations than arguments. They derive all their logical force from certain principles which are implied in their details, and without which these details could have no bearing on the existence of God. The very idea of Design itself is such a principle. It is the die which the mind stamps upon nature; it is not in nature itself. Any complete argument for the Being of God, therefore, involves equally *à priori* and *à posteriori* elements. The former are necessary as the rational foundation of the argument; the latter are necessary to illustrate, to give life and body to the general principles which lie at the foundation.

The Christian doctrine of the Godhead will be considered under the several names of Trinity, Son of God, and Holy Spirit.

GOD, Offences against. See Sacrilege.

GOD SAVE THE KING (or **QUEEN**), the noble national anthem of Great Britain, and by adoption that of Prussia and the German states, and which is played and sung in every part of the British empire alike on solemn and festive occasions, has been a subject of controversy with respect to its origin. Its words are apparently imitated from the Domine Salvum of the Catholic Church service. In England, the authorship has been generally attributed to Dr John Bull, born 1563, in 1591, organist in Queen Elizabeth's Chapel, 1596, professor of music in Gresham College, and chamber-musician of James I. About the period of the discovery of the Gunpowder Plot, he composed and played on a small organ before the king an ode beginning with the words, 'God save great James our king.' He died at Lübeck, 1622. It does not appear, however, that this, or any other old composition of a similar title, had any connection with that which we now possess. Chappell, in his *Popular Music of the Olden Time,* and Dr Fink, a German musical antiquary, have settled the question; the honour of this great work, both words and melody, must be given to Dr Henry Carey, an English poet and musician, born in London about 1696, died 1743. The words and music were composed in honour of a birthday of George II., and performed for the first time at a dinner given on that occasion in 1740 by the Mercers' Company of London. The words and music were first published in the *Harmonia Anglicana*, 1742, and appeared in the *Gentleman's Magazine*, 1745. The air, according to Dr Arne, has preserved its original form, but its harmonies have been modified by various artists; and the words were changed on the accession of William IV., and on that of Queen Victoria.

GODA'VERY, or **GODAVARI**, one of the principal rivers of the peninsula of Hindustan, and the largest of the Deccan, rises within 50 miles of the Arabian Sea, and flows south-east across the peninsula into the Bay of Bengal. Its source is in the eastern face of the Western Ghauts, in lat. 19° 58′ N., and long. 73° 30′ E.; and its two mouths, diverging in lat. 16° 57′ N., and long. 81° 49′ E., enter the sea respectively in lat. 16° 48′ and long. 82° 23′, and in lat. 16° 18′ and long. 81° 46′. About 23 miles above the head of the delta, the G. emerges at Polaveram from the Eastern Ghauts, through which it has passed with so moderate a descent as to be navigable in either direction. The southern arm of the G. admits vessels drawing eight or nine feet; and the northern one shews a depth of two or three feet more. Like tropical streams in general, the river varies greatly, according to the season, in breadth and depth. But a dam or annicut (see CAUVERY) has been constructed, so as to mitigate the evil for the purposes alike of navigation and of irrigation. The entire length of the G. is about 900 miles.

GOD-BOTE, an ecclesiastical fine, paid for crimes and offences against God. The word bote, the same as boot, is the old Saxon bot or bote, a reparation or satisfaction—e. g., man-bote was the compensation due for the life of a man.

GO'DESBERG, a village of Rhenish Prussia, with a fine ruin, is situated on a conical hill in the midst of a plain, on the left bank of the Rhine, and four miles south of Bonn. It has a mineral spring, is a favourite summer residence, and has a population of 1170. It derives its name, not from Woden, who is said to have been worshipped here, but more probably from the Gau-ding, or Goding, the district court which may have held its sittings at this place. The castle was erected by Dietrich, the Archbishop of Cologne (1208—1213), with materials taken from the ancient chapel of St Michael, the ruins of which are still standing near the castle. In 1582, Gebhard, the deposed archbishop, took refuge here, and intrusted the castle to a Dutch garrison. It was, however, soon after taken by his successor, on which occasion it sustained much injury. During the Thirty Years' War, it was alternately in the possession of the Swedes and the Imperialists, and was finally almost demolished by the French. Only one fine tower, 90 feet in height, is still standing. It commands a magnificent prospect of the Siebengebirge and great part of the valley of the Rhine, and is, on this account, much visited by strangers.

GODFATHER AND GODMOTHER, the person who, by solemnly presenting to the minister of baptism the candidate for that sacrament, which is regarded as a new spiritual birth, is reputed to contract towards the newly baptized the relation of spiritual paternity or maternity. The effects of the usage are differently estimated in the different communions.

In the Roman Catholic Church, the parties presenting a child for baptism are called, from the spiritual *parental* relations which they contract, 'godfather' (*patrinus*) and 'godmother' (*matrina*); and from the *engagement* into which they enter on behalf of the baptized, 'sponsors' (*sponsores*). The spiritual bond resulting from this relation is regarded as a species of kindred (whence the name *gossip*, or God-sib, *spiritually akin*), and constitutes, by the canon law, an impediment of marriage between the sponsors upon the one hand and the baptized and the parents of the baptized on the other. Anciently, this impediment arose also between the sponsors themselves, who were often very numerous, and extended besides to the other members of the kindred; but the Council of Trent limited the number of sponsors to 'one or two,' and restricted the matrimonial impediment within the limits above described. The parents of the baptized are not permitted to act as sponsors in the Roman Catholic Church, one of the objects of the institution being to provide instructors in case of the death of parents; nor are members of religious orders, because their inclusion within their convent is supposed to render it impossible for them to discharge permanently and regularly the duties of instructors to the newly baptized. In the Roman Catholic sacrament of confirmation also, the candidate is commonly presented by one sponsor, generally, though not necessarily, of the same sex with the candidate for confirmation. It is difficult to assign the precise date of the origin of this institution. No trace of it occurs in the New Testament, but it is believed to have been in use in the 2d c., and it certainly was an established practice in the fourth.

In the Church of England, two godfathers and a godmother are required at the baptism of a male, and two godmothers and a godfather at that of a female. In order to be admitted as such, the person must be baptized, must be of full age, acquainted with the Lord's Prayer, Creed, and Ten Commandments, and familiar with the fundamental truths of Christianity. No impediment of marriage arises in the English Church from the relation of the sponsors to the baptized. Practically, the usage in the Church of England has, for the most part, degenerated into a mere form; godfathers and godmothers usually giving themselves little concern in the future fate of the infant whose spiritual condition they become bound to watch over. In the Church of Scotland, and other non-Episcopal Churches, the parents of the infant occupy the place of sponsors; the father expressly taking the vows on the occasion.

GODFREY OF BOUILLON, Duke of Lower Lorraine, born about 1061, at Baisy, a village of Belgian Brabant, was the eldest son of Count Eustace II. of Boulogne, and Ida, sister to Gottfried or Godfrey, the Hunchback, Duke of Lower Lorraine and Bouillon, whom he succeeded in the government of the latter duchy in 1076. He served with great gallantry in the armies of the Emperor Henry IV., both in Germany and Italy; and it was from his hand that the competitor for the imperial crown, Rodolf of Swabia, received his deathblow at the battle of Merseburg. When the first Crusade was set on foot, the fame of his exploits caused him to be elected one of the principal commanders. In order to defray the expenses of the Crusade of 1095, he mortgaged Bouillon to the Bishop of Liège, and set out, accompanied by his brothers Eustace and Baldwin, in the spring of 1096. For a detailed account of his career up till the taking of Jerusalem, see CRUSADES. Eight days after the taking of Jerusalem, G. was proclaimed king by the unanimous voice of the crusading army; but the piety and humility of the conqueror forbade him to 'wear a crown of gold where his Saviour had worn one of thorns.' He declined the regal title, contenting himself with that of Defender and Guardian of the Holy Sepulchre. The Sultan of Egypt, learning that the army of 300,000 Crusaders who had taken Antioch had dwindled away to 20,000, advanced against them with an army said to have amounted to 400,000 men; but G. gave him battle in the plain of Ascalon, and the victory gained on this occasion put him in possession of the whole of Palestine, a few fortified towns only excepted. He now directed his endeavours to the organisation of the new state; he installed a patriarch, founded two cathedral chapters, built a monastery in the valley of Jehoshaphat, and drew up laws. He died in 1100, and his body was interred on Mount Calvary, near the Holy Sepulchre. History represents this prince as a model of piety, valour, and all kingly virtues; and his praises have been worthily sung by Tasso in his *Jerusalem Delivered.*

GODI'VA, Lady, patroness of Coventry. About the year 1040, Leofric, Earl of Mercia, and Lord of Coventry, then an important market-town, imposed certain onerous services and heavy exactions upon the inhabitants, of which they loudly complained. His wife, the Lady G., having the welfare of the town at heart, besought her husband to give them relief, and was so earnest in her entreaties, that at length, to escape from her importunities, the earl said he would grant her the favour, but only on condition that she would ride naked through the town, supposing, from the modesty of Lady G., that he had required an impossible condition; but he was surprised with the answer: 'But will you give me leave to do so?' As he could not in justice refuse, she ordered that proclamation be made that on a certain day no one should be away, or even look, from their houses, when, clothed only by her long hair, she rode through the town; and her husband, in admiration of her intrepid devotion, performed his promise. This circumstance was commemorated by a stained-glass window, mentioned in 1690, in St Michael's Church, Coventry; and the legend that an unfortunate tailor, the only man who looked out of a window, was struck blind, has also found commemoration in an ancient effigy of 'Peeping Tom of Coventry,' still to be seen in a niche of one of the buildings. By a charter of Henry III., 1218, a fair is held at Coventry, beginning on Friday of Trinity-week, and lasting eight days. The fair was opened with a grand civic procession, a part of which was, in 1678, the representation of the ride of Lady Godiva. These processions were continued at intervals of from three to seven years, until 1826. Some beautiful woman, who represented Lady G., was the principal figure, but many other historical and emblematic personages were introduced. In 1848, the procession was revived with great splendour, and the spectacle attracted more than 15,000 strangers. The fair of 1862 was opened with a similar procession.

GÖDÖLÖ, a market-town in Hungary, formerly the residence of the princely family Grassalkovich, is distinguished for its manorial castle, as well as for the surrounding parks. It was on the woody heights of G. and Isaszeg that the combined armies of Austria, under Prince Windischgrätz and Count Jellachich, were defeated in two bloody battles by the Hungarians under Görgei. On the eve of victory, Governor Kossuth held a conference with the generals Görgei, Klapka, and Damjanich, for laying down the principles of the famous Declaration of Independence, issued on the 14th of April 1849, by the diet at Debreczin. It was this declaration which served the emperor of Russia as a pretext for the invasion of Hungary.

GODOLPHIN, Sydney, Earl of Godolphin, an English statesman, was descended from an old Cornish family, and was born, it is thought, about 1640. After the Restoration he became one of the grooms of the bed-chamber to Charles II., was appointed one of the secretaries of state in 1664, and soon after first commissioner of the treasury; was twice despatched to Holland in 1678 on business of importance, and argued and voted for the exclusion of the Duke of York from the succession in 1680. Nevertheless, when the latter mounted the throne, G. (now Baron Godolphin of Rialton, in Cornwall) was made lord-chamberlain to the queen; and on the landing of the Prince of Orange, he was one of the commissioners sent by King James to treat with the invader—a difficult piece of business, which he is considered to have managed with much tact and prudence. William was not slow to perceive the admirable abilities of G., and in 1690 appointed him first lord of the treasury. In 1695 he was one of the seven lords justices for the administration of the government during the king's absence. In 1702, on the accession of Anne, he accepted the office of lord high treasurer, mainly at the solicitation of Marlborough, who paid him a splendid compliment by declaring that otherwise he could not venture to assume the command of the British armies, as he could depend on him alone for punctual remittances. G. fully realised the expectations of the great Captain. He raised the public credit, induced the queen to contribute £100,000 towards the war, firmly opposed the selling of offices and places, and increased the stipends of the inferior clergy. In 1706, G. was raised to the dignity of Earl of Godolphin and Viscount Rialton; after this period he took part with the Whigs, as being more patriotic and English than the Tories. The contest between him and Harley for the premiership, resulted finally in the defeat of G., who was dismissed from office in 1710. He died at St Albans, September 15, 1712, and was interred in Westminster Abbey. The title became extinct in his son Francis, second Earl of Godolphin. G. was the best business-man of his age. He had the clearest and quickest understanding, and liked to do his work in such a way that it would not require to be done over again. In an age of corruption, G. was believed to be incapable of bribery, and he never employed as his agents any except men of integrity. His 'talent for silence' equalled William's own.

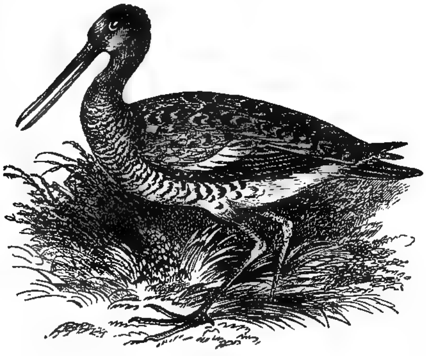
GODOY. See Alcudia.

GOD'S TRUCE (Lat. *Treuga Dei*, or *Treua Dei*, from the Ger. *Treu*, true), one of the most singular among the institutions of the middle ages, which prevailed specially in France and the Germanic empire, but was also received for a time in the other countries of Europe. It consisted in the suspension for a stated time, and at stated seasons and festivals, of that right of private feud for the redress of wrongs, which, under certain conditions, was recognised by medieval law or usage. Private feuds, it is true, could only, by the medieval law, which was called *Faustrecht* and *Fehderecht*, be undertaken when judicial redress had failed or could not be enforced, and after formal notice had been served upon the party against whom they were levied. But even with this limitation, private feuds multiplied exceedingly. The public peace was subject to constant interruption; the weak were without resource; the strong bore down all by the terror of their arms; and the whole social framework was so utterly disorganised, that men, by one of those religious impulses of which this age offers so many examples, fell back upon the aid of the church, and invoked her influence, as the only effectual means of staying the evil. It was in this crisis that the 'God's Truce' originated. In the end of the 10th c., a council assembled at Limoges, at which the princes and nobles bound themselves, by solemn vow, not only to abstain from all unlawful feuds, but also to keep the peace mutually towards each other, and to protect from violence all defenceless persons, clerics, monks, nuns, women, merchants, pilgrims, and tillers of the soil. A similar engagement was entered into in a council at Orleans in 1016; and the whole body of the bishops of Burgundy enforced it upon their flocks everywhere throughout that duchy. A plague which visited a great part of Europe soon afterwards gave a fresh impulse to the movement; and in the year 1033, the 'Holy Peace' was almost universally received, and for a time continued to be religiously observed. But as the old abuse began to revive by degrees, it was felt that the observance would carry with it more of religious authority, if, instead of being, as it had originally been instituted, universal, it was limited to certain times and days, which themselves had certain religious associations connected with them. Accordingly, in 1041, the bishops of Aquitaine limited the God's Truce to the week-days specially consecrated by the memory of the Passion and Resurrection of Christ—that is, from the sunset of Wednesday to sunrise of Monday. The same decree was renewed at Narbonne in 1054, and at Troyes in 1093. At Clermont, in 1095, it was extended to the whole interval from the beginning of Advent to the Epiphany, and from the beginning of Lent to Pentecost, to which times were afterwards added several other festivals. These enactments were adopted or renewed at several later councils; and although they were often disregarded, it is impossible to doubt that they had a wide and lasting influence in mitigating the evil against which they were directed. This singular institution fell gradually into disuse, and at last disappeared altogether, when the right of private redress was restricted, and at last entirely abolished, by the law of the empire.

GODWIN, William, an English author, was born at Wisbeach, in Cambridgeshire, March 3, 1756. His father and grandfather were Presbyterian ministers, and he was educated to the same profession, first at a school at Norwich, to which place his father had removed in 1767, where he made rapid progress in classical studies, and afterward at a Presbyterian college at Hoxton, where he pursued his theological studies. From 1778 to 1783, he was minister to a congregation in the neighbourhood of London; but the zeal with which he first entered upon his duties declined, and a change in his theological opinions made it necessary for him to resign his charge. His only resource was to remove to the metropolis, and engage in literature. His first work, a series of *Historical Sketches*, in the form of sermons, was unsuccessful, and he was reduced to penury and despair; but they made him acquainted with Fox, Sheridan, and other Whig leaders, and he turned his attention to politics. The American revolution, closely followed by that of France, excited the public mind, and G. wrote his *Inquiry Concerning Political Justice*, 1793. This was followed by *The Adventures of Caleb Williams*, a remarkable novel, which is still popular, and *The Iron Chest*, a tragedy, which keeps its place upon the stage. An able defence of Horne Tooke and others, published in the *Morning Chronicle*, advanced his reputation; and in 1797, he published *The Inquirer*, a collection of essays on morals and politics. About this time, he formed an alliance with Mary Wollstonecraft, the celebrated author of the *Rights of Woman*, and adopted and defended her extreme social views. After some months, however, they yielded so far to custom as to be married. His wife died a short time after in giving birth to a daughter, who afterwards became the second wife of the poet Shelley. In 1799, he published *St Leon*, a romance; and the next year visited Ireland, where he associated with Curran, Grattan, and other eminent Irish political leaders. He also consoled himself for the loss of his wife by writing her Memoirs. In 1801, he married again, and had a son, who died of cholera in 1832. To secure a more certain support, G. and his wife opened a circulating library, but he also worked indefatigably with his pen to the end of his life. He wrote many school-books, an admirable *Life of Chaucer* (1801); *Fleetwood*, a novel, 3 vols. (1805); *Mandeville*, in 1817; a *Treatise on Population*, a refutation of Malthus, in 1820; a *History of the Republic of England*, in 4 vols. (1824—1828); *Cloudesley* (1830); *Thoughts on Man* (1833). As he grew old, he modified his opinions on politics and society, and especially on marriage, which he warmly commends in some of his later works. Being now 77 years old, he was appointed to a place under government, which removed him from the apprehension of want; but he knew not how to be idle, and wrote *Deloraine*, a novel, and the *Lives of the Necromancers*. Many of his works were translated into foreign languages. He died in London, April 7, 1836.

GODWIN, Earl of Wessex, a famous Saxon noble, was born towards the end of the 10th century. Originally, it is said, he followed the occupation of a cow-herd; but having found means to ingratiate himself with Ulfr, the brother-in-law of King Canute, the latter gave him his daughter in marriage, and he soon became one of the most powerful of the English nobles. More than any other person, he contributed to the elevation of Edward to the English throne (1044 A.D.); and the principal reward of his services was the marriage of his beautiful and accomplished daughter Editha with the English king. This union, however, was not a happy one. Editha was cruelly neglected by Edward, and her father, on account of his dislike of the Normans, incurred the royal enmity. His estates were seized, and given to favourites, and he and his family fled. Queen Editha was made to feel even more bitterly than any one the misfortunes of her family. Her own husband seized her dower; he took from her her jewels and her money, 'even to the uttermost farthing;' and allowing her only the attendance of one maiden, he closely confined her in the monastery of Wherwell, of which one of his sisters was lady-abbess. Meanwhile, shoals of Normans visited England for the purpose of making, or rather getting fortunes. Among Edward's most favoured guests for a time was Duke William of Normandy, better known as William the Conqueror. The banished earl, however, had not been idle; through frequent correspondence with his countrymen at home, he kept alive the antipathy of the English to the Norman favourites of Edward, and in the summer of 1052 he landed on the southern coast of England. The royal troops, the navy, and vast numbers of the burghers and peasants, went over to him; and finally the king was forced to grant his demands. The Normans were for the most part expelled from the country, the G. family was restored to all its possessions and dignities; and at a meeting of the Witenagemôte, 'the earls and all the best men of the land' declared that the foreigners alone were to be held guilty of the late dissensions that had distracted the country. G. did not long survive his triumph; he died April 7, 1054.

GO'DWIT (*Limosa*), a genus of birds of the family *Scolopacidæ*, with very long bill, slightly curved upwards, and long slender legs, great part of the tibia bare. All the species frequent marshes and shallow waters, chiefly those of the sea-coast, where they seek their food by wading and by plunging the long bill into the water or mud like snipes. They sometimes also run after small crustaceans or other animals, and catch them on the sands, from which the tide has retired. Two species occur in Britain, the BLACK-TAILED G. (*L. melanura*) and the BAR-TAILED G. (*L. rufa*), both birds of passage, and not unfrequent visitors of the marshy parts of the east coast of England, where the first occasionally breeds; but both generally breed in more northern countries, and are seen in Britain chiefly in their migrations northward and southward. Both species are very widely distributed over Europe, Asia, and Africa. The females are rather larger than the males, and the whole length of the female black-tailed G., which is rather the largest species, is about 17 inches, the bill alone being four inches long. They are much esteemed for the table, and are sent from Holland to the London market, which also receives some from the fens of Lincolnshire.



Bar-Tailed Godwit (*Limosa rufa*).

GOES, or **TERGOES**, a town and fortified seaport of Holland, in the province of Zeeland, is situated in a fruitful district in the island of South Beveland, about 3½ miles from its northern coast, and 17 miles west of Bergen-op-Zoom. It is well built; has a harbour formed by a canal communicating with the East Scheldt, ship-building docks, besides an active trade in hops, salt, and agricultural produce. Pop. 5400.

GOETHÉ, JOHANN WOLFGANG VON, the acknowledged prince of German poets, and one of the most highly gifted and variously accomplished men of the 18th century. He was born in the year 1749 at Frankfurt-on-the-Maine, where his youthful years were spent. His father, Johann Kaspar Goethe, was an imperial councillor, in good circumstances, and in a respectable position. In the year 1765, he went to the university of Leipsic, of which Ernest and Gellert were then the most notable ornaments. As a student, he pointed, by external profession, towards the law; but his real studies were in the wide domain of literature, philosophy, and above all, life and living character. In the year 1770, he went to Strasburg, to finish his juridical studies; but here also anatomy and chemistry, Shakspeare, Rousseau, and architecture—anything rather than the statute-book—occupied his time and exercised his soul. Here it was that one of the earliest, certainly the most famous of those youthful love-adventures took place, which, in his biography, as in that of Robert Burns, play such a prominent part—the well-known affair of Frederica Brion, of Seisenheim. With regard to these matters in general, it may be said that he was more readily moved to love than intense in love; and that the objects of his admiration generally seem to have had more reason to boast of the delicacy of his susceptibility, than of the perseverance of his devotion. How far there was anything more than commonly culpable in these connections, will always be a question; certain it is that they will always tarnish to some extent the otherwise fair reputation of the poet. The female sex will never forgive the man who was so light to lend his heart, and so fearful to give his hand; and British morality will always be inclined to pass a severe judgment on the man who, professing the profoundest subjection to law and order in everything else, seems to have shrunk from the golden clasp of legitimate marriage as from some conventional shackle, which a free and great nature should avoid. In the year 1771, the young poet, now 22 years of age, took his degree as Doctor of Laws, and went for a short while to Wetzlar on the Lahn, the seat of the imperial chamber of the then German empire, and which afforded peculiar facilities for young men engaged in the study of public law. Here, however, as in other places, his knowledge of the human heart, and of human character, altogether overgrew his professional studies; and Wetzlar became to him the scene of the famous *Sorrows of Werther*, a glowing leaf from the life of the human soul, full of interest and beauty at all times, but which, in the then state of European thought and feeling, stirred the whole literary mind of Europe like a breeze sweeping over a forest. The book was not published till 1774. After returning from Frankfurt, G. spent some years in his native city, engaged chiefly in literary productions. His first great work was *Götz von Berlichingen*, translated into English by Sir Walter Scott, published at Frankfurt, 1773, which at once set the Germans free from the painful constraint of French and classical models, and opened up to them that career of bold originality, which they have since prosecuted in so many departments of literature, learning, and speculation. In the year 1775, G., who had had the good-fortune to gain the good opinion of Karl August, Grand Duke of Saxe-Weimar, accepted an invitation from that prince to settle in his little capital, since become so famous as the Athens of the great legislative age of German literature. Here the poet became a little statesman; and occupying himself in various ways in the service of his benefactor, passed quickly through stages of court preferment, till, in 1779, he became 'actual privy-councillor,' at the age of 30, holding the highest dignity that a German subject could then attain; a great, a rich, and an influential man. In 1782, he received a patent of nobility; and in the following years, till 1788, travelled much in Switzerland and Italy, of which last journey we have the beautiful fruits in *Iphigenia*, *Egmont*, *Tasso*, and the *Venetian and Roman Elegies*. Of this last work, thoroughly German both in form and feeling, the heroine was Christiana Vulpius, a highly attractive though not a highly gifted woman, who bore him a child—his eldest son—in 1789; but whom, though he always treated her as his wife, he did not formally marry till 1806. In 1792, he took part in the German campaign against France, of which he has left a memoir. In the year 1815, he was made minister of state. After the death of the grand duke, in 1828, he lived much in retirement, occupied occasionally with poetry, but much more intensely and constantly with the study of nature and the fine arts, which from his earliest years had possessed the strongest attractions for him. He died in March 1832, in his eighty-fourth year.

To give a detailed account of the literary and scientific productions of G.'s pen, is altogether impossible within the limits of the present work; much less can we attempt any detailed criticism of these works. The best source of reference to the mere English reader is the biography of the poet, by G. H. Lewes; along with which may be taken G.'s interesting conversations with Eckermann, translated by Oxenford. On the general character and literary position of G., however, a few words are necessary. It is as a poet, no doubt, that this remarkable man is generally known and recognised in this country; but it is not as a poet only that a just measure can be taken of his intellectual calibre or of his European significance. It is as poet, thinker, critic, and original observer of nature, all combined in one admirable harmony, that his rare excellence consists. We do not find in literary history any intellect that can fitly be placed on the same platform with G.; that presents, in such grand and graceful completeness, so much severe thought, combined with so much luxuriant imagination; so much accurate science with so much playful fancy; so much simplicity with so much art; so much freshness and originality of productive power, with so much justness and comprehensiveness of critical judgment. As a dramatist, G. will not compare for a moment with the great masters of that art among ourselves. His English biographer detects in the constitution of his mind, most justly, 'a singular absence of historic feeling and dramatic power.' Not less correct is the judgment of the same writer when he says: 'Goethe was attached to character and picture, indifferent to action and event.' In this respect, the poet was a true type of his nation. As contrasted with the French and English, the Germans are deficient in nothing so remarkably as in stirring passion and progressive energy; the relation of G. to Shakspeare and the English dramatists is exactly the same. Nevertheless, *Faust* is a great poem, even a great dramatic poem, for it is full of dramatic scenes, though they are not sufficiently moved by the living current of dramatic action. *Faust* is essentially a German poem, and yet a poem which all foreigners can read and enjoy. It is the great drama of that moral and metaphysical questioning which thoughtful minds must go through in all times and places, but which has received the fullest and most fruitful development in modern Germany. Of the other poetical works of G., *Iphigenia, Hermann and Dorothea,* and *Tasso,* are those which most strongly bear the type of the ripe manhood of the author. The form and style of these classical works are characteristically Greek; by which we mean they are chiefly remarkable for profundity of thought and truth of feeling, expressed in the most simple, graceful, and unpretending manner. In soul, however, they are essentially German; and the most deep-thinking of the Germans are always the first to claim G. as the most German of all German poets in spirit, though very few great German writers have so carefully avoided the most characteristic German defects of style. In the extraordinary value which he attaches to 'the form,' G. authenticates himself everywhere as at once a great modern Greek and a great artist.

G. is a poet who is thoroughly relished only by those who understand thoroughly the German language, and whose minds are not so typically English as to exclude a ready sympathy with German thoughts and feelings. With general English readers, for various reasons, Schiller will always be the favourite poet. Nevertheless, there has been a considerable amount of literary power in this country spent in the translation of G.'s works, specially of his great work, the *Faust;* of this, at least a dozen translations exist, the most notable being by Anster, Blackie, and Hayward. Some of the most beautiful of the lyric poems have been aptly rendered in a conjunct volume by Professor Aytoun and Theodore Martin.

GOG AND MAGOG, names several times used in the Bible, and the names given to the famous figures of giants in Guildhall, London. Magog is spoken of by the writer of Genesis as a son of Japhet; Ezekiel speaks of Gog, prince of Magog; Gog and Magog are spoken of in the Revelation. Magog is considered by some the father of the Scythians and Tartars. The Persians have also been derived from Magog, and the Goths from Gog and Magog. The Caucasus is supposed by Bochart to derive its name from Gog Chasan—fortress of Gog. Our Guildhall giants boast of almost as high an antiquity as the Gog and Magog of the Scriptures, as they, or their living prototypes, are said to have been found in Britain by Brute, a younger son of Anthenor of Troy, who invaded Albion, and founded the city of London, at first called Troy-novant, 3000 years ago. Albion, at this period, was inhabited by a race of tremendous giants, the descendants of the thirty-three infamous daughters of the Emperor Diocletian, who, having murdered all their husbands, were sent to sea in a ship, and were happy enough to reach Albion, where, cohabiting with wicked demons, they gave birth to the giants, whom the Trojans finally conquered, leading the last two survivors prisoners to London, where they were chained to the gates of a palace on the site of Guildhall, and there kept as porters. When they died, their effigies were set up in their place. This is Caxton's account; but there is another, which represents one of the giants as Gogmagog, and the other as a British giant who killed him, named Corineus. However the fact may have been, the two giants have been the pride of London from time immemorial. On London Bridge, they welcomed Henry V. in 1415; they welcomed Henry VI. to London in 1432; and in 1554, Philip and Mary. In 1558, they stood by Temple Bar, when Elizabeth passed through the city gate. The old giants were burned in the great fire, and the new ones were constructed in 1708. They are 14 feet high, and occupy suitable pedestals in Guildhall. The ancient effigies, which were made of wicker-work and pasteboard, were carried through the streets in the Lord Mayor's Shows, and copies of the present giants were in the show of 1837. Formerly, other towns in England had their giants, and there are famous and some very large ones in several continental cities. The Antigonus of Antwerp is 40 feet high, and was formerly carried in the most solemn religious as well as civic processions. Gayant, the giant of Douai, is 22 feet high. There are also giants, and families of giants, at Lille, Malines, Brussels, &c., each connected with some popular tradition of their respective cities. The arms of Antwerp, a castle with severed hands, are connected with the legend of the giant who lived in the castle, and cut off the hands of those who failed to pay his exactions. Though it is now impossible to ascertain the facts, there can be little doubt that all these civic giants are exaggerated representatives of real persons and events.

GO'GARI, a river rising in Nepaul, about lat.

27° 20′ N., and long. 85° 46′ E., joins the Coosy, an affluent of the Ganges, in lat. 25° 24′ N., and long. 87° 16′ E., after a course of 235 miles.

GO'GO, a large town and a seaport of British India, in the presidency of Bombay, is situated on the west shore of the Gulf of Cambay, and has safe anchorage during the south-west monsoon, with smooth water and a muddy bottom. It is in lat. 21° 39′ N., and long. 72° 15′ E.

GOGOL, Nikolai, a Russian author of great and original genius, was born at the village of Wassiljewka, in the government of Poltova, in 1810. On finishing his studies, he went to St Petersburg, and solicited government employment, which was refused, on the ground, that 'he did not know Russian.' Shortly after, he proved that the officials were in the wrong by publishing a collection of novels and sketches, entitled *Vechera na Khutorie* (Evenings at a Farmhouse). The first and most important of these tales contains a vivid picture of Cossack manners, enabling us, according to M. Sainte-Beuve, to comprehend the profound antipathies that have for ages characterised the relations of certain branches of the Slavic family to each other. Then come the 'King of the Gnomes;' the 'History of a Fool,' which is more a satire than a psychological study; and 'The House-keeping of Former Times,' a little masterpiece of its kind. The success of *Evenings at a Farmhouse* was immense, and Russian critics compared G.'s style to that of Washington Irving. It was followed by *Mirgorod*, a supplementary volume, of the same character, containing stories full of poetry, and exciting astonishment not less by the vigour and grasp of mind displayed in the delineation of character, than by the extraordinary skill with which the plots are formed and unravelled. G. now turned his attention to the dramatic art, and produced the *Revisor*, a comedy of brilliant genius, whose appearance on the stage excited quite a furor. The purpose of this piece was to expose the rooted abuses of the internal administration of Russian affairs. The Emperor Nicholas was the first to applaud its morality, and shewed his approbation by appointing the author professor of history in the university of St Petersburg. While holding this office, he published, in 1842, *Pokhozhdeniya Chichagova ili Mertvuiya Dushi* (Adventures of Chichagov, or Dead Souls), of which a bad translation appeared in English in 1854, under the title of *Home-life in Russia*). The aim of this novel was to extinguish serfdom by ridicule. Exhausted by his labours, G. sought permission to travel, and visited Italy, where he took up his residence. There, however, his opinions appear to have undergone a change. From being an ardent Russian liberal and reformer, he became an apologist of despotism, an apostasy which he lived to regret. After the commotions of 1848, he returned to Russia, and died at Moscow in 1851.

GOHILWA'R, or GOHELWAD, a native principality, tributary at once to the Guicowar of Guzerat and to the British government, lies on the eastern coast of the peninsula of Kattywar, stretching in N. lat. from 20° 56′ to 22° 3′, and in E. long. from 71° 14′ to 72° 13′, and containing 3500 square miles, and 247,980 inhabitants. The chief's revenue is about 740,000 rupees a year, out of which he pays two tributes, about 80,000 rupees to the government of Bombay, and about 40,000 to the Guicowar.

GOIL, Loch, a small but highly picturesque loch in Argyleshire, Scotland, is a branch of Loch Long (q. v.), and is six miles in length, and about one mile in breadth. Its shores are for the most part wild and rugged; but the general character of the scenery is modified by extensive natural woods of hazel, which stretch along the shore. The mountains in the neighbourhood rise to the height of about 2500 feet. It may be visited by steamers from Glasgow.

GO'ITO, a small town in Lombardy, about 15 miles north-west from Mantua, occupies a beautiful though somewhat marshy position on the Mincio. This town, owing to its vicinity to the stronghold of Mantua, has been the field of various military operations. In 1630, it was carried by assault by the imperialists, who entered Mantua on the same night, and took it by surprise; during the war of the Spanish Succession in 1701, it was alternately captured by the allies and the imperialists; and in 1796 the French took it, but were expelled, after a brief tenure, by the Austrians. In 1814, a severe engagement took place at G. between the Austrian and Italian troops; and during the war of independence in 1848, it became the theatre of two further battles between the same powers, to which it owes its modern celebrity. Population inconsiderable.

GOI'TRE, an enlargement of the Thyroid Gland (q. v.), occupying the front of the neck, and sometimes of such a size as to project downwards over the breast, and even to admit of being thrown over the shoulder. Goitre is for the most part an endemic or local disease, being found in the mountainous regions of the Alps, Andes, and Himalaya, especially, it is said, where lime prevails largely as a geological formation. The proofs of goitre being connected with a calcareous impregnation of the drinking-water are rather strong, but perhaps not quite sufficient, especially as regards this country, though the chief seat of goitre in England, Derbyshire, is subject to this alleged cause. Goitre is met with endemically, to a slight extent, in various parts of Scotland; but on a very small scale indeed as compared with Switzerland, in which it is a very important deformity, especially when connected with Cretinism (q. v.). Goitre is of two kinds: the one due to increased development of the vessels of the gland, the other to the growth of Cysts (q. v.) in its substance. To these might perhaps be added a third, which is found in connection with functional disease of the heart, but which is perhaps only a variety of the vascular goitre. The usual treatment of goitre is by the administration of very minute doses of Iodine (q. v.) for a long time together. The use of this remedy is due to Coindet of Geneva, who recognised it as the principal source of the virtues of burned sponge, long of high repute in the treatment of goitre.

GOLCO'NDA, a fortress of the Nizam, situated seven miles to the north-west of his capital, Hyderabad, stands in lat. 17° 22′ N., and in long. 78° 25′ E. In its immediate neighbourhood are the ruins of an ancient city, once the metropolis of the kingdom of Golconda. The place itself is still strong; but its strength is seriously impaired through its being overtopped, within breaching-range, by the yet solid mausolea of its former sovereigns, which form a vast group at a distance of 600 yards. These tombs are dome-crowned structures of gray granite, each having its own mosque, and occupying the centre of its own elevated terrace. G. is proverbially famous for its diamonds; but, in truth, they are merely cut and polished here, being generally found at Parteall, near the southern frontier of the Nizam's dominions.

GOLD (symbol Au, atomic weight 99·6) has been known and regarded as the most precious of the metals from the earliest ages of the world, and has been universally employed as a medium of exchange. Although the quantity of G. which is found, when compared with that of many other metals, is small, yet there are few parts of the globe in which it does not occur more or less abundantly.

In the native state, it occurs crystallised, the primary form being the cube, or in plates, ramifications, or nodules—popularly known as *nuggets*—which sometimes are of very considerable size. It is almost always alloyed with silver, and sometimes with tellurium, bismuth, lead, &c. It sometimes occurs in small quantity in metallic sulphides, as in galena, iron and copper pyrites.

The extraction of G. from the substances with which it is associated is effected more by mechanical than by chemical means. See below.

The following are its most important properties. In its compact state, it possesses a characteristic yellow colour and high metallic lustre, is nearly as soft as lead, and is the most malleable of all metals. It can be beaten into leaves of a thinness not exceeding $\frac{1}{200000}$, or, according to some authors, $\frac{1}{280000}$ of an inch, through which light passes with a green tint; one grain may thus be distributed over 56 square inches of surface; and the ductility of the metal is so great, that the same quantity may be drawn out into 500 feet of wire. In its tenacity, it is inferior to iron, platinum, copper, and silver; but a wire whose diameter is 0·787 (or rather more than one-third) of a line (which is one-twelfth of an inch), will support a weight of about 150 lbs. It fuses at about 2016°, according to Daniell's pyrometer, and when in fusion, is of a bluish-green colour. It is scarcely at all volatile in the heat of the furnace, but by a powerful electric discharge, by the concentration of the sun's rays by a powerful burning-glass, or by the oxy-hydrogen jet, it is dispersed in purple vapours. G. has very little affinity for oxygen; it undergoes no change on exposure to the atmosphere, and is unaffected by hydrochloric, sulphuric, or nitric acid, or, in short, by any simple acid except selenic acid; nor do the alkalies affect it. It is, however, dissolved by any mixture which liberates chlorine, its usual solvent being *aqua regia*, which is generally prepared by mixing 1 part of nitric acid with 4 parts of hydrochloric acid. Hydrochloric acid to which binoxide of manganese has been added, acts equally well, the G. in these cases being converted into a chloride. This metal is one of the most perfect conductors both of heat and of electricity. When precipitated in a finely comminuted state, it is of a brown colour; but when suspended in water, and viewed by transmitted light, it appears purple. The specific gravity of this metal is less than that of platinum and iridium, ranging from 19·2 to 19·4, according as it is fused or hammered.

The alloys of G., or its combinations with other metals, are very numerous, those with copper and mercury being the most important. Copper and G. combine in all proportions without materially affecting the colour of the latter, except that it is somewhat redder. The density of the compound is less than that of G., but the hardness is greater, and it is more fusible. It is this alloy which is employed in our gold coinage, 11 parts of G. being combined with 1 of copper, without which the coin would not be sufficiently hard to stand the wear to which it is exposed. Hence British standard G. contains 8·33 per cent. of copper. In France, and in the United States, standard G. contains 10 per cent. of the latter metal. Jewellers alloy their G. with other metals, partly on economical grounds, and partly for the purpose of evolving special tints. Thus, red G. is obtained by combining 75 parts of fine G. with 25 of copper; green G., by combining 75 parts of fine G. with 25 of silver; dead-leaf G., by combining 70 parts of fine G. with 30 of silver; water-green G., by combining 60 parts of fine G. with 40 of silver; blue G., by combining 75 parts of fine G. with 25 of iron.

Mercury and G. combine very readily, and yield a white alloy, termed an *amalgam*, which is used in gilding. In consequence of the readiness with which these metals unite even at ordinary temperatures, mercury is used for the extraction of gold.

As a general rule, the ductility of G. is much impaired by alloying other metals with it, while its hardness and sonorousness are increased.

Two oxides of G. are known—a protoxide, AuO, and a teroxide, AuO_3. Neither of these oxides can be formed by the direct union of the elements, and both of them are reduced by heat. The protoxide is a dark-green or bluish-violet powder. It forms no definite salts. It is obtained by the decomposition of protochloride of G. with a solution of potash. The teroxide is a brown powder, which is reduced, not only by heat and light, but by many other reducing agents. It combines more readily with bases than with acids, and hence has been termed *auric acid*. We obtain it by mixing a solution of terchloride of G. with magnesia or carbonate of soda, and boiling.

Two chlorides of G. are known, corresponding to the oxides, viz., a protochloride, AuCl, and a terchloride, $AuCl_3$. Of these, the latter is the most important: it is obtained by dissolving G. in aqua regia, and evaporating the solution to dryness, at a temperature not exceeding 300°, when we obtain this compound, as a deliquescent yellowish brown or reddish mass, which is soluble in water, alcohol, and ether, with which it forms orange-coloured solutions.

The chlorides of many of the organic bases form crystallisable double salts with the terchloride of G.; and these compounds are often employed to determine the combining power of the organic alkali.

Metallic G. in the form of a brown powder is thrown down from the solution of the terchloride by most reducing agents. This reducing power of protosulphate of iron is employed in the preparation of chemically pure gold.

A bisulphide of G. is obtained in the form of a black powder by passing a current of sulphuretted hydrogen through a cold solution of terchloride of gold. 'If finely divided gold be heated with sulphur in contact with carbonate of potash, a double sulphide of gold and potassium is formed; it resists a red heat, and is very soluble in water; this sulphur salt is used for gilding china, and produces the colour known as *Burgos lustre*.'—Miller's *Elements of Chemistry*, 2d edit. vol. ii. p. 74.

Fulminating G., a compound known to the alchemists, who (Basil Valentine, for example) formed solutions of terchloride of G., occurs as a green powder, when prepared by immersing teroxide of G. (or auric acid) in caustic ammonia. By modifying the mode of preparation, we obtain it of a brownish-yellow colour. From Dumas's analysis of the green powder, it seems to be represented by the formula $2NH_3,AuO_3$, the brownish-yellow powder having a more complicated formula. These powders detonate when rubbed, struck, or beaten, or when an electric spark is passed through them, with a loud sharp report and a faint light, and they yield nitrogen gas, ammonia, and water. None but professed chemists should attempt to prepare them, in consequence of their dangerous explosive character. On one occasion, a drachm of fulminating G. introduced into a bottle burst it as the stopper was being turned round, in consequence of small particles of it having adhered about the mouth, and both the operator's eyes were destroyed by the projected fragments of glass.

The *Purple of Cassius* is an important gold compound. It derives its name from its having been first described by Andreas Cassius in 1685. See CASSIUS, PURPLE OF.

None of the salts of the oxides of G. are of sufficient importance to require notice in this article.

For the description of *Mosaic Gold*, see TIN.

GOLD was, in all probability, one of the earliest discovered of the metals. The fact of its being found very generally distributed over the surface of the earth, and that, too, in its simple metallic state, combined with its beautiful colour, and many valuable properties, would cause it very early to attract the attention of man. Accordingly, we learn that gold was used by the Hebrews, the Egyptians, and other ancient nations, for much the same purposes as it is at the present day.

Previous to the great Californian discovery in 1847, Europe was to a great extent supplied with G. from Mexico, Brazil, New Granada, Chili, and Peru in North and South America; a large quantity was also obtained from Asiatic Russia and the islands of the Indian Archipelago; the east and west coast of Africa furnished a less but still considerable quantity. All these countries still produce G., but their total yield, including Europe, is only about one-fourth that of California and Australia.

The most famous mines in Europe are those of Hungary and Transylvania, which produce annually about £300,000 worth of this metal. Piedmont and Spain are almost the only other European countries where G. is worked; but it is found in all districts where the rivers flow over primary rocks, though rarely in sufficient quantity to repay the expense of working it.

G. has been found in several parts of the British Islands. The most productive district yet discovered was that of Wicklow, in Ireland, where, towards the close of the last century, the stream-works were prosecuted for some time with considerable success. In Scotland, the Leadhills, on the borders of Dumfriesshire, as well as the Highlands of Perthshire, have at various times produced G.; so also have Cornwall and Devonshire in England, and, at the present time, a small quantity is being obtained from North Wales.

First among the celebrated gold discoveries of recent times, in point of date, though not in importance, come those of Eastern Siberia, where extensive auriferous tracts were discovered in the governments of Tomsk and Yeniseisk in 1842. The quantity obtained in these eastern regions raised the annual produce of the Russian empire to three, and ultimately to four millions sterling—more than triple its former yield. Concerning Russia, it may be well to remark that an examination of the auriferous deposits of the Ural Mountains led Sir Roderick Murchison, in 1844, on comparing their rocks with those brought home by Count Strzelecki from Australia, to predict the presence of G. on the latter continent. Subsequent discoveries, as is well known, have proved the accuracy of this conclusion in a very remarkable degree.

The rich gold region of California was discovered in September 1847. Mr Marshall, the contractor for a saw-mill on the estate of Captain Suter—a Swiss emigrant, settled on the banks of the Sacramento River—detected particles of G. in the sand of the mill-race, and on further examination, it was found that valuable deposits existed throughout the bed of the stream. Intelligence of the discovery soon reached the town of San Francisco, whose scanty population at once abandoned their usual occupations to join in the exciting search for gold. The supply was soon found to be abundant over a large area; it occurred in the tributaries of the Sacramento as well as in the bed of the river itself, in old water-courses, and on the sides of the hills. Emigrants quickly poured in from all parts of the American continent, and ere long from Britain, Germany, and other European countries, till the population of San Francisco alone rose from under 200 in 1845 to 40,000 in 1858. At first, it was thought that the supply of G. from this region would soon fail, but it would appear by later researches to be far from being easily exhausted, as the supply, though now apparently decreasing, continued for several years at upwards of £13,000,000 per annum. See SAN FRANCISCO.

In 1851, before the excitement of the Californian discovery had time to subside, the world was startled by the announcement of another, or rather by a series of others, of not less importance, in Australia. It is a curious fact that not only Sir R. Murchison, as stated above, but also the Rev. W. B. Clarke, a native geologist, had pointed out the likelihood of G. being found in the eastern chain of the Australian mountains, several years before the value of the gold-fields near Bathurst was discovered by Mr Hargraves in April 1851. This discovery was no sooner made, however, than several other places in Bathurst and the adjoining counties were found to contain rich deposits; so that, before many months had passed, 6000 persons were employed at these *diggings*. In August of the same year, further discoveries of G. were made at Ballarat, in Victoria, which excelled in richness those of the Sydney district; and these, in turn, were soon surpassed by fresh discoveries in the Mount Alexander range. During the climax of the excitement created by the Victoria gold-fields, the number of diggers rose to upwards of 20,000, withdrawing for a time the great mass of the population from Melbourne and Geelong.

The modes of working adopted at the first start of the diggings were necessarily rude and wasteful; the fortunes of the gold-seekers, too, were of course very variable under such a system, many of them having made large profits—as much, in a few instances, as a thousand pounds and upwards in a single week—but many more met with nothing but disappointment. A more systematic plan of mining, however, has now been introduced, by which the auriferous deposits are more completely worked out, and the labour of the miners rendered less precarious. Notwithstanding this, the annual produce of the Australian colonies has now (1862) fallen to about £8,000,000, only two-thirds of what they produced a few years ago. In the International Exhibition of 1862 there was a gilded pyramid 10 feet square at the base and 45 feet high, representing the mass of gold exported from Victoria between the 1st October 1851 and the 1st October 1861. Its weight in solid gold would have been 26,162,432 ounces troy, which, taken roundly at £4 per ounce, gives its value as £104,649,728. The produce of California since the discovery of its gold-fields in 1847, up to the present time, may be estimated at about 37,500,000 ounces, and its value at £150,000,000.

Since the two great gold regions of California and Australia became known, three new ones of considerable promise have been discovered—one of them in British Columbia, the value of which was proved in 1858, although previously it was to some extent known to the Hudson's Bay Company; another is being successfully developed in Nova Scotia; and a third in the province of Otago, in New Zealand, the recent accounts from which are very encouraging. It would appear that there is a great similarity between the general rock systems and auriferous deposits of this region and those of Australia. Before passing from the subject of recent gold-fields, it is worth noting that, a few years ago, Dr Livingstone the African traveller discovered G. near Tete on the Zambesi—a district which may be found to be rich in the precious metal, when more deliberately surveyed. Its position is remarkable as occurring in the centre of a coal-field.

The annual produce of G. in the whole world at the present time is somewhere between 30 and 40 millions sterling. Wherever G. is found, its origin can generally be traced to quartz veins in the primary or volcanic rocks, such as granite, gneiss, porphyry, clay-slate, or greenstone. As these rocks become decomposed by the action of the weather, portions of the auriferous veins are carried down by streams and floods, and so find their way into the deposits of sand, clay, and shingle in river-beds, and in the gullies and flats of hills. Many auriferous drifts are of great thickness, formed by long-continued wasting of the rocks of neighbouring hills, and therefore require mining to a considerable depth. G. for the most part is found in small grains, or scales, called gold-dust; some of it, however, in pieces, or *nuggets* of considerable size. The largest yet met with was found at Ballarat in 1858, called 'The Welcome;' it weighed 2166 oz., and its value was £8376, 10*s*. 10*d*. A good deal of the Mexican and European G. is obtained from auriferous pyrites; that is, the sulphuret of iron, copper, or arsenic, with the G. disseminated through it.

Nearly all the metals except G. are found, for the most part, at least, as ores chemically combined with oxygen, sulphur, or other substances; and they therefore require to be separated by chemical processes. Gold ores, if we may use the term, generally only require to be mechanically treated by the processes of crushing, stamping, grinding, and washing. The amalgamation process, however, is resorted to when the G. occurs in a state of fine division.

The crushing-mill consists of two large cast-iron cylinders or rollers revolving in opposite directions, which break the ore into small pieces as it passes through between them. To reduce it further, a stamping-mill is used with iron-shod piles of wood, or sometimes with stampers entirely of iron, wrought by an axle with projecting cams after the fashion of flint-mills and beetling-machines. To pulverise it still further, any form of grinding-mill is used, but the grinding surfaces should be of iron or of some hard rock like granite. The pounded ore is finally sifted and washed by machines, which vary in shape and mode of working, but they all consist essentially of sieves, to separate the larger from the smaller particles, and an inclined table or frame, across which a stream of water flows. The gold particles, on account of their greater specific gravity, remain at the head of the board, and the quartz and other impurities are carried forward and separated by the current.

By the above treatment, the greater part of the G. is extracted, but there still remain minute particles invisible to the naked eye mixed with the *gangue;* indeed, some auriferous soils contain all their G. in a state of extreme division. To recover this, the ore is partially concentrated by washing, and then an amalgam is made; that is, it is mixed with mercury, which has the power of seizing on and dissolving the gold particles, however minute. The mercury is afterwards distilled off in a cast-iron retort, leaving the G. nearly pure.

To give some idea of the quantity of G. used in the arts, of which very little can be recovered, it may be stated that in the United Kingdom some 30,000 ounces in the shape of leaf gold, 10,000 ounces in the electroplate and other processes of gilding metals, and about the same quantity in gilding and making colours in the pottery districts, are annually consumed.

The quantity of G. poured into England during recent years has been immense. See GREAT BRITAIN. What has become of it all is often matter of surprise. Much has been sent to the mint, and much sent to foreign countries for their gold coinage. In France, Belgium, the Netherlands, and Italy, all large sums are now paid in G., instead of silver as formerly. That the continued influx of G. is gradually heightening prices in the United Kingdom is sufficiently obvious. The current price of standard gold is about £3, 17*s*. 6*d*.

GOLD-BEATER'S SKIN, a delicate membrane prepared from the large intestine of the ox, and used as a dressing for slight wounds, as the fabric for court-plaster, &c., but chiefly by gold-beaters. See GOLD-BEATING. The outer or peritoneal membrane is used for this purpose. The intestine is first subjected to a partial putrefaction, by which the adhesion of the membranes is sufficiently diminished to enable them to be separated; the separated membrane is then further cleaned from the adhering muscular fibres, dried, beaten, and pressed between paper, besides being treated with alum, isinglass, and white of egg, the object of which is to obtain the pure continuous membrane free from grease and impurities, without allowing the putrefactive processes to weaken it. A packet of 900 pieces of skin, each four inches square, is worth £8. They may be beaten continuously for several months with a twelve-pound hammer without material injury. The intestines of 500 oxen are required to furnish the 900 leaves that form one packet, or *mould*, as it is technically called. The manufacture is an extremely offensive one. Chlorine has been introduced both as a disinfectant and to assist in the separation of the membrane.

GOLD-BEATING, the process by which gold is extended to thin leaves used for gilding. The gold used for this purpose is usually alloyed with silver or copper, according to the colour required. See GOLD. For *deep gold*, an alloy containing about 1 part of copper to 20 of pure gold is used. As goldleaf is not sold by weight, but by superficial measure, and as increasing the quantity of alloy diminishes the malleability, there is but little temptation to use the baser metals as an adulteration.

The gold is first cast into oblong ingots about $\frac{3}{4}$ths of an inch wide, and weighing two ounces. The ingot is flattened out into a ribbon of about $\frac{1}{800}$th of an inch in thickness by passing it between polished steel rollers. This is annealed or softened by heat, and then cut into pieces of one inch square; 150 of these are placed between leaves of vellum, each piece of gold in the centre of a square vellum leaf, another placed above, and so on till the pile of 150 is formed. This pile is enclosed in a double parchment case, and beaten with a 16-pound hammer. The elasticity of the packet considerably lightens the labour of beating, by causing the hammer to rebound with each blow.

The beating is continued until the inch-pieces are spread out to four-inch squares; they are then taken out, and cut into four pieces, and squares thus produced are now placed between *gold-beater's* skin instead of vellum, made into piles, and enclosed in a parchment case, and beaten as before, but with a lighter hammer. Another quartering and beating produces 2400 leaves, having an area of about 190 times that of the ribbon, or a thickness of about $\frac{1}{200,000}$th of an inch. An ounce of gold is thus extended to a surface of about 100 square feet. A still greater degree of thinness may be obtained, but not profitably. After the last beating, the leaves are taken up with wood pincers, placed on a cushion, blown out flat, and their ragged edges cut away, by which they are reduced to squares of $3\frac{1}{4}$ inches. Twenty-five of these are placed between the leaves of a paper-book, previously rubbed with red chalk, to prevent adhesion of the gold, and are sold in this form.

Attempts have been made to apply machinery to gold-beating, but though very ingenious, their application is very limited; most of the goldleaf is still beaten by hand.

GOLD COAST. See GUINEA.

GOLD-EYE (*Hyodon*), a genus of malacopterous fishes, inhabiting the lakes and rivers of North America; the type of a family, *Hyodontidæ*, of which other members are found in tropical America and in Borneo. They are small fishes, much compressed like herrings, feed on insects like trouts, and like them are often taken by anglers with artificial flies. They have the mouth abundantly armed with teeth, having teeth far back on the palate as well as on the tongue and jaws.

GOLDFISH, or **GOLDEN CARP** (*Cyprinus auratus*), a fish of the same genus with the carp, a native of China, but now domesticated and naturalised in many parts of the world. It is said to have been originally confined to a lake near the mountain Tsien-king, in the province of The-kiang, in China; but this statement is of questionable accuracy. It has been long common in many of the fresh waters of China, and was introduced into England about the end of the 17th or beginning of the 18th century. On account of the brilliancy of its colours and the ease with which it is kept in glass globes or other vessels, in apartments, it soon became, and has continued to be, a general favourite. Its ordinary length is five or six inches, but it has been known to reach a foot. When young, it is of a blackish colour, but acquires its characteristic golden red as it advances to maturity, some individuals (*Silver-fish*) becoming rather of a silvery hue. Monstrosities of various kinds are frequent, particularly in the fins and eyes. The G. is now plentiful in some of the streams of Southern Europe, from which it is imported into Britain; but it also breeds in ponds in Britain, particularly in those into which hot water is poured from steam-engines, which sometimes swarm with its fry. In confinement, it may be fed with worms, insects, crumbs of bread, yolks of eggs dried and powdered, &c. Frequent changing of the water is advantageous, not only because of its being more fresh and better aërated, but because of the animalcules thus supplied for food.

GOLDLACE, a fabric formed by weaving silken threads that have been previously gilded. The peculiarity of this manufacture consists in the gilding of the silk in such a manner that it shall retain sufficient flexibility for weaving. A deep yellow or orange coloured silk is used for the purpose. The usual method of doing this, is by what is called 'fibre plating.' A rod of silver is gilded by simply pressing and burnishing leaves of gold upon it. This gilded silver is then drawn into very fine wire, so fine that one ounce of metal can be extended to the length of more than a mile. It is then flattened between polished steel rollers, and further extended so that a mile and a quarter weighs only one ounce; for the last drawing, the wire is passed through ruby dies. The film of gold upon this flattened wire is much thinner than beaten goldleaf, and has frequently been quoted as an example of the divisibility of matter, as one inch of the highly gilded wire contains but the eighty-millionth part of an ounce of gold, or $\frac{1}{100}$ of an inch, which is a visible quantity exhibiting the colour and lustre of gold, contains but $\frac{1}{800,000,000}$ of an ounce, or one ounce of gold covers more than 100 miles of wire. This flattened gilded wire is then wound over the silk, so as to enclose it completely, and produce an apparently golden thread.

Other means of directly gilding the thread have been tried, and for some purposes are successful, but none have yet been discovered which give the thread the same degree of lustre as the above, which was first practised in a ruder manner by the Hindus.

Mr Hock's method of fibre gilding is to pass the silk through a mucilaginous solution, and then receive it on a brass cylinder, over which it is closely rolled. Goldleaf is then laid upon this coil of gummed silk, and thus one side is coated. The other side is gilded by rolling it from the first on to a second cylinder in the opposite direction, thus the plain side falls outermost, and is then coated with goldleaf as before. This is rather cheaper than the fibre plated silk, and more flexible, but not so brilliant.

GOLD MINES. In England, the crown has *prima facie* the right to gold mines; but where the gold is found in other mines, the crown is entitled only to take the gold at a fixed price. In Scotland, by an ancient act of 1592, the owner of the ground can demand a feu thereof from the crown, on paying one-tenth of the produce.

GOLD OF PLEASURE (*Camelina*), a genus of plants of the natural order *Cruciferæ*, having an erect calyx, small bright yellow flowers, and inflated pear-shaped or wedge-shaped pouches. The species are few. The common Gold of Pleasure (*C. sativa*), (Fr. *Cameline*, Germ. *Dotter*) is an annual plant $1\frac{1}{2}$—3 feet high, with terminal racemes and pear-shaped pouches; the leaves smooth, bright green, entire or slightly toothed, the middle stem-leaves arrow-shaped and embracing the stem. Notwithstanding its high-sounding English name, the plant is of humble and homely appearance. It grows in fields and waste places in Europe and the north of Asia; it is not regarded as a true native of Britain, although often found in fields, particularly of flax, its seed being very commonly mingled with flaxseed imported from the continent. In many parts of Germany, Belgium, and the south of Europe, it is extensively cultivated for the sake of the abundant oil contained in its seeds. The seeds and the oil-cake made from them are also used for feeding cattle, although inferior to linseed, and to the oil-cake obtained from linseed. The oil, although sweet and pure at first, is very apt to become rancid, and is less valued than that of rapeseed or colza; the seeds of Gold of Pleasure are often mixed with rapeseed for the production of oil. The value of the plant in agriculture depends much on its adaptation to poor sandy soils, although it prefers those of a better quality; and on the briefness of its period of vegetation, adapting it for being sown after another crop has failed, or for being ploughed down as a green manure. The seed is sown either broadcast or in drills. The crop is cut or pulled when the pouches begin to turn yellow; but the readiness with which seed is scattered in the field, rendering the plant a weed for future years, is an objection to its cultivation. It is not much cultivated in any part of Britain. The stems are tough, fibrous, and durable, and are used for thatching and for making brooms; their fibre is even separated like that of flax, and made into very coarse cloth and packing-paper.

The seeds are used for emollient poultices, which allay pain, particularly in cutaneous diseases.

GO'LDAU, formerly a small town of Switzerland, in the canton of Schwytz, was situated in a valley between Mount Rossberg on the north and Mount Rigi on the south, five miles north-west of the town of Schwytz, and is memorable for its destruction by one of the most stupendous and fatal landslips on record. The upper portion of the slope of the Rossberg, consisting of a layer of stone resting on light soil, had been loosened by continuous rains, which percolated under the rock, and in a measure washed the soil from beneath it. On the 2d September 1806, toward the evening, the outer layer of rock became completely detached, and rushed down the mountain in a south-western direction into the valley. In a few minutes not only G. but the neighbouring villages of Busingen and Rothen were overwhelmed in destruction, a part of the Lake of Lauwerz was filled up, and by the sudden overflowing of the water the land to the west of Seewen was devastated. Two churches, 111 dwelling-houses, 220 outhouses containing many cattle, and 400 men were buried in one moment. Only a few of the unhappy inhabitants who, at the moment of the landslip, were at some distance from the scene, were saved. A numerous company of travellers, who were on the point of commencing the ascent of Mount Rigi, were overtaken on the bridge of G. by the landslip, and perished. The valley is now a wild rocky waste, but grass and moss are gradually creeping over and veiling its more rugged features. On a height in this valley through which the highway leads from Arth to Schwytz, a chapel has been erected. Compare Zry's *G. und seine Umgegend* ('G. and its Neighbourhood,' Lucerne, 1829).

GO'LDBERG, a manufacturing town of Prussia (of great antiquity), in the province of Silesia, is situated on an eminence on the banks of the Katzbach, 10 miles south-west of Liegnitz. It owes its origin and name to the gold-mines, which were worked here from the earliest times. At the commencement of the 12th c., they are said to have yielded 150 pounds of pure gold weekly. After the great victory won by the Mongol hordes near Liegnitz in 1241, in which 600 of the miners of G. perished, the town was taken by the conquerors. It also suffered greatly during the Thirty Years' War, and in 1813 was the scene of two engagements, the first between the French and Russians, and the second between the French and Prussians. G. is surrounded by double walls pierced by four gates; and is now celebrated for its manufactures of broadcloth, hosiery, and gloves, and for its fruit. Pop. 7040.

GOLDEN AGE. In the mythologies of most peoples and religions, there exists a tradition of a better time, when the earth was the common property of man, and produced spontaneously all things necessary for an enjoyable existence. The land flowed with milk and honey, beasts of prey lived peaceably with other animals, and man had not yet by selfishness, pride, and other vices and passions, fallen from a state of innocence. At the foundation of this legend lies the deeply-rooted opinion, that the world has degenerated with the progress of civilisation, and that mankind, while leading a simple, patriarchal life, were happier than at present. The Greeks and Romans placed this golden age under the rule of Saturn; and many of their poets—as, for example, Hesiod, in his *Works and Days*, Aratus, Ovid, and, above all, Virgil, in the first book of the *Georgics*—have turned this poetic *matériel* to admirable account, and defined the gradual decadence of the world, as the silver, the brass, and the iron ages, holding out at the same time the consolatory hope that the pristine state of things will one day return.

GOLDEN BEETLE, the name popularly given to many of a genus of coleopterous insects, *Chrysomela*, and of a tribe or family, *Chrysomelinæ* or *Chrysomelidæ*, belonging to the tetramerous section of the order. The body is generally short and convex, the antennæ are simple and wide apart at the base; some of the species are destitute of wings. Many are distinguished by great splendour of colour. None are of large size. The finest species are tropical, but some are found in Britain. Some of them, in the larva state, commit ravages on the produce of the field and garden.

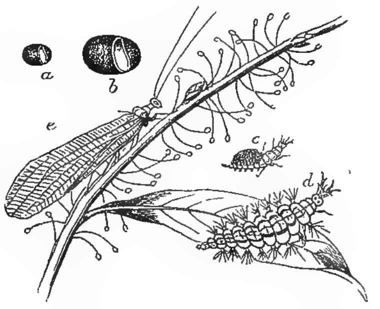
GOLDEN BULL (Lat. *Bulla Aurea*, Ger. *Goldene Bulle*), was so called from the gold case in which the seal attached to it was enclosed. The imperial edict known in German history under this title, was issued by the Emperor Charles IV., mainly for the purpose of settling the law of imperial elections. Up to this time much uncertainty had prevailed as to the rights of the electoral body, claims having frequently been made by several members of the lay electoral families, and divisions having repeatedly arisen from this uncertainty; the effect of such divisions being to throw the decision for the most part into the hands of the pope. In order to obviate these inconveniences, the golden bull defines that one member only of each electoral house shall have a vote—viz., the representative of that house in right of primogeniture, and in case of his being a minor, the eldest of his uncles paternal. On the great question as to the dependence of the imperial office on the pope, and as to the right of the pope to examine and approve the imperial election, the golden bull is silent, although it declares the emperor competent to exercise jurisdiction in Germany from the moment of election. It invests the vicariate together with the government of the empire during the interregnum, in the Elector Palatine, and the Elector of Saxony; but it is remarkable that this only applies to Germany. On the vicariate of Italy, which was claimed by the popes, nothing is said. The golden bull also contains some provisions restraining the so-called *Faustrecht* (literally, 'fist-law'), or right of private redress. It was solemnly enacted in two successive diets at Nürnberg and Metz, in the year 1336, and original copies of it were furnished to each of the electors, and to the city of Frankfurt. The electoral constitution, as settled by this bull, was maintained almost unaltered till the extinction of the empire.

In Hungarian history there is a constitutional edict called by the same name. It was issued by Andrew II. in the early part of the 13th century. Without entering into details, it will be enough to say that the Golden Bull of Andrew II. changed the government of Hungary from an absolutism to an aristocratic monarchy, and that it contained till recent times the charter of the liberties of Hungary, or perhaps of the privileges of the noble class. See Schmidt's *Geschichte der Deutschen*, iii. 638.

GOLDEN-CRESTED WREN (*Regulus aurocapillus*), a very beautiful bird of the family *Sylviadæ*, the smallest of British birds. Its entire length is scarcely three inches and a half. Notwithstanding its English name, it is not really a wren, but this name continues in popular use rather than *Regulus* and *Kinglet*, which have been proposed instead. The golden-crested wren is greenish-yellow on the upper parts, the cheeks and throat grayish-white; the crown feathers elongated, and forming a bright yellow crest. In its habits, it is intermediate between the warblers and the tits. It particularly affects fir-woods. It is not uncommon in Britain, from the most southern to the most northern parts; but many come also from more northern countries to spend the winter, and it is on record that, in October 1822, thousands were driven on the coast of Northumberland and Durham by a severe gale from the north-east. The nest of this bird is suspended from the outermost twigs of a branch of fir, some of them being interwoven with it.—Another species (*R. ignicapillus*), with more vividly red crest, is sometimes found in Britain, and species are found in Asia and North America.

GOLDEN-EYE. See GARROT.

GOLDEN-EYE FLY (*Hemerobius perla*, or *Chrysopa perla*), a neuropterous insect, common in Britain; pale green, with long threadlike antennæ, long gauze-like wings, and brilliant golden eyes. Its flight is feeble. The length, from the tip of the antennæ to the tip of the wings, is almost an inch and a half, but the insect without wings and antennæ is not above one-third of this length. The female attaches her eggs, in groups of 12 or 16, by long hairlike stalks, to leaves or twigs. They have been mistaken for fungi. The larvæ are ferocious-looking little creatures, rough with long hairs, to which particles of lichen or bark become attached; they are called *aphis-lions*, and are very useful by the destruction of aphides, on which they feed. The pupa is enclosed in a white silken cocoon, from which the fly is liberated by a lid.



Golden-eye Fly (*Chrysopa perla*)
(Copied from Morton's *Encyclopædia of Agriculture*):
a, cocoon; *b*, the same magnified; *c*, larva; *d*, the same magnified, and freed from adhering substances; *e*, perfect insect, on a branch to which its eggs are attached.

GOLDEN FLEECE, in Greek tradition, the fleece of the ram Chrysomallus, the recovery of which was the object of the Argonautic expedition. See ARGONAUTS. The Golden Fleece has given its name to a celebrated order of knighthood in Austria and Spain, founded by Philip III., Duke of Burgundy and the Netherlands, at Bruges, on the 10th January 1429, on the occasion of his marriage with Isabella, daughter of King John I. of Portugal. This order was instituted for the protection of the church, and the fleece was probably assumed for its emblem, as much from being the material of the staple manufacture of the Low Countries, as from its connection with heroic times. The founder made himself Grand-Master of the order, a dignity appointed to descend to his successors; and the number of knights, at first limited to 24, was subsequently increased. After the death of Charles V., the Burgundo-Spanish line of the House of Austria remained in possession of the order; but at the close of the Spanish war of succession, the emperor, Charles VI., laid claim to it in virtue of his possession of the Netherlands, and taking with him the archives of the order, celebrated its inauguration with great magnificence at Vienna in 1713. Philip V. of Spain contested the claim of Charles; and the dispute, several times renewed, was at last tacitly adjusted by the introduction of the order in both countries. The insignia are a golden fleece hanging from a gold and blue enamelled flintstone emitting flames, and borne in its turn by a ray of fire. On the enamelled obverse is inscribed *Pretium laborum non vile.* The decoration was originally suspended from a chain of alternate firestones and rays, for which Charles V. allowed a red ribbon to be substituted, and the chain is now worn only by the Grand-Master. The Spanish decoration differs slightly from the Austrian. The costume consists of a long robe of deep red velvet, lined with white taffetas, and a long mantle of purple velvet lined with white satin, and richly trimmed with embroidery containing firestones and steels emitting flames and sparks. On the hem, which is of white satin, is embroidered in gold, *Je l'ay empris.* There is also a cap of purple velvet embroidered in gold, with a hood, and the shoes and stockings are red. In Austria, the emperor may now create any number of knights of the Golden Fleece from the old nobility; if Protestants, the pope's consent is required. In Spain, princes, grandees, and personages of peculiar merit are alone eligible.

GOLDEN LEGEND (Lat. *Aurea Legenda*), a celebrated collection of hagiology, which for a time enjoyed almost unexampled popularity, having passed through more than a hundred editions, and translations into almost all the European languages. It is the work of James de Voragine, also written 'Vragine' and 'Varagine,' who was born about the year 1230. He entered the Dominican order, and was elected, at a comparatively early age, provincial of the order in Lombardy in 1267. Towards the end of that century, he was elected Archbishop of Genoa; and by his ability, his moderation, and his exemplary life, he played a most influential part in the public affairs of his time, being called more than once into the councils of the popes themselves, in affairs of difficulty. The Legenda consists of 177 sections, each of which is devoted to a particular saint or festival, selected according to the order of the calendar. In its execution, the work, as may well be supposed from its age, is far from critical, but it is deserving of study as a literary monument of the period, and as illustrating the religious habits and views of the Christians of that time. It presents a very different phase of the medieval mind from that which is exhibited in the acute and severely philosophical lucubrations of the schools; but both must be read together, in order to make up the intellectual ideal of the time.

GOLDEN NUMBER for any year is the number of that year in the Metonic Cycle (q. v.), and as this cycle embraces 19 years, the golden numbers range from 1 to 19. The cycle of Meton came into general use soon after its discovery, and the number of each year in the Metonic cycle was ordered to be engraved in letters of gold on pillars of marble, hence the origin of the name. Since the introduction of the Gregorian calendar, the point from which the golden numbers are reckoned is 1 B. C., as in that year the new moon fell on the 1st of January; and as by Meton's law the new moon falls on the same day (1st of January) every 19th year from that time, we obtain the following rule for finding the golden number for any particular year, '*Add* 1 *to the number of years, and divide by* 19, *the quotient gives the number of cycles and the remainder gives the golden number for that year; and if there be no remainder, then* 19 *is the golden number, and that year is the last of the cycle.*' The golden number is used for determining the Epact (q. v.), and the time for holding Easter (q. v.).

GOLDEN-ROD (*Solidago*), a genus of plants of the natural order *Compositæ*, sub-order *Corymbiferæ*, closely allied to *Aster*, but distinguished by the single-rowed pappus and tapering—not compressed—fruit. The species are natives chiefly of temperate climates, and are most numerous in North America. A few are European; only one is British, the COMMON G. (*S. Virgaurea*), a perennial plant of very variable size, as there is a small alpine variety (sometimes called *S. Cambrica*) only a few inches high, whilst the common variety, found in woods and thickets in most parts of Britain, is from one to four feet high. It has erect panicled crowded racemes of small yellow flowers. It is an ornamental plant, and is sometimes seen in gardens. It had at one time a great reputation as a vulnerary, whence the name Solidago, it is said, from Lat. *solidare*, to unite. The leaves of this and a fragrant North American species, *S. odora*, have been used as a substitute for tea. They are mildly astringent and tonic.

GOLDEN ROSE, a rose formed of wrought gold, and blessed with much solemnity by the pope in person on Mid-lent Sunday, which is called, from the first word of the festival, 'Lætare Sunday.' The prayer of blessing contains a mystic allusion to our Lord as 'the flower of the field and the lily of the valleys.' The rose is anointed with balsam, fumigated with incense, sprinkled with musk, and is then left upon the altar until the conclusion of the mass. Formerly, in the solemn papal procession of the day, the pope carried it in his hand. It is usually presented to some Catholic prince, whom the pope desires especially to honour, with an appropriate form of words. The origin of the ceremony is uncertain, but the most probable opinion as to its date is that of Martêne and Du Cange, who fix it in the pontificate of Innocent IV. See Wetser's *Kirchen Lexicon*, vol. ix. 397.

GOLDEN RULE, a process in arithmetic, so called from the universality of its application. See PROPORTION.

GOLDFINCH (*Fringilla carduelis*, or *Carduelis elegans*), a pretty little bird of the family Fringillidæ, a favourite cage-bird, on account of its soft and pleasing song, its intelligence, its liveliness, and the attachment which it forms for those who feed and caress it. The genus *Carduelis* is distinguished by a thick conical bill, without any bulging, attenuated and very sharp at the tip. There are two groups, and one British species of each—a group with gay plumage and more prolonged bill, of which the G. is the British representative, and another with darker plumage and shorter bill, represented by the Aberdevine (q. v.), or Siskin. The G. is about five inches in entire length; black, blood-red, yellow, and white are beautifully mingled in its plumage. The colours of the female are duller than those of the male. It is widely diffused throughout Europe, and is found in some parts of Asia. It is a common bird in Britain, more abundant in England than in Scotland, but somewhat local. It is to be seen in small flocks on open grounds, feeding on the seeds of thistles and other plants, and in the earlier parts of the season frequents gardens and orchards. Its nest is made in a tree, bush, or hedge, is remarkable for its extreme neatness, and is always lined with the finest downy material that can be procured. The eggs are four or five in number, bluish white, with a few spots and lines of pale purple and brown. The G. is much employed by bird-catchers as a call-bird. It can be trained to the performance of many little tricks; that which, most of all, the trainers seem to prefer being the raising of water for itself as from a well, in a bucket the size of a thimble.—The AMERICAN G. (*F.* or *C. tristis*) is very similar to the European species, has very similar habits and song, and displays the same interesting liveliness and affectionateness in domestication. The nest is also of the same elegant structure. It is a common bird in most parts of North America.

GOLDO'NI, CARLO, the most celebrated writer of comedy among the Italians, was born at Venice in 1707, and received his first education at Rome. His father originally intended him for an actor, and fitted up a private theatre for his diversion at home, but the boy shewed no aptitude for histrionic performances, and in consequence he was sent to Pavia to study for the church. G., however, was still less fitted for being an ecclesiastic than an actor, and was finally expelled from college for writing scurrilous satires. In 1731, after his father's death, he was received as advocate; but finding the legal profession by no means lucrative, he relinquished its practice, and set about composing comic almanacs, which became highly popular. Several of his minor comedies were represented about this time, and attracted much public favour by their novelty as well as their real merit. In 1736 he espoused the daughter of a notary of Genoa, and subsequently went to Bologna, where, having obtained an introduction to Prince Lobkowitz, he was intrusted with the composition of an ode in honour of Maria Theresa, and with the organisation of the theatrical entertainments of the Austrian army. We next hear of him at Florence, working assiduously at comedies, which were, however, but an earnest of his best pieces. On his return to Venice he made very lucrative arrangements with the manager of the theatre of St Luke, and after a visit to Rome passed into France, and was appointed Italian master to the royal children, which situation allowed him to devote himself tranquilly to his literary occupations. In Paris he produced one of his most admired comedies, written in French, and entitled *Le Bourru bienfaisant* (The Benevolent Grumbler). It excited universal admiration, and drew forth a most eulogistic criticism from the pen of Voltaire. On the breaking out of the revolution, G. lost his pension, and died (January 1793) shortly before its restoration by decree of the Convention. The greater part of it was allowed to his widow, who likewise received the arrears due from the time of its cessation. G. has left 150 comedies of unequal merit. The larger part are inimitable representations of the events of daily life, under both their simplest and most complex aspect. One aim pervades steadily all G.'s compositions—the advancement and elevation of honourable sentiments and deeds, and the flagellation of the prevailing vices and follies of the day.

GOLDSCHMIDT, MADAME (JENNY LIND), a celebrated Swedish singer, was born at Stockholm, October 6, 1821. She was of humble parentage, and her musical gifts were first noticed by an actress, by whose influence she was admitted, at the age of nine, into the Conservatory of Stockholm, where she received lessons of Crœlius and Berg. She sang before the court with success, and at the age of 16 appeared in the *rôle* of Agatha, in *Der Freischütz.* Four years later, she went to Paris, to receive lessons from Garcia. Her voice was now thought wanting in volume, and when she appeared at the Grand Opera two years later, her failure was so mortifying, that she is said to have resolved never again to sing in France. Returning to Stockholm, she was heard with enthusiasm in *Robert le Diable*, and at the instance of Meyerbeer was engaged at Berlin in 1845. After singing two years in Prussia, she visited Vienna, and other German cities, and made her *debut* in London in 1847, with a very marked success. Her return to Stockholm was greeted with an ovation, and the tickets to the opera in which she appeared were sold at auction. She returned to London in 1849, and won an immense triumph. The royal family and court were present at nearly every representation, and the receipts were often over £2000. The London season was followed by a concert tour in the provinces, with a similar success, and her great popularity was increased by the distribution of a large part of her receipts in charities. In 1850 she made an engagement with Mr P. T. Barnum of New York, for a concert tour in America, extending through the United States, British provinces, Mexico, and the West Indies. The receipts of this well-managed tour were 610,000 dollars, of which Mademoiselle Lind received 302,000 dollars. While in America, she was married to M. Otto Goldschmidt, the pianist who accompanied her, born at Hamburg 1828. They returned to Europe in 1852, and resided at Dresden after she had visited Stockholm, and expended £40,000 in endowing schools in her native country. Since this period Madame G. has sung only at concerts in England and on the continent, and on rare occasions. Her voice is a contralto of moderate range, but much power and expression. Her kind manners and abundant charities have contributed greatly to her popularity and success.

GO'LDSINNY, or **GOLDFINNY**, a name given to certain small species of *Crenilabrus*, a genus of fishes of the Wrasse family (*Labridæ*). They are rare on the British coasts, but are more plentiful on those of the north of Europe. They frequent rocky coasts, and are sometimes taken by anglers from the rocks. They receive their name from their prevalent yellow colour. Like the wrasses, they have a very elongated dorsal fin.

GOLDSMITH, Oliver, was born in the village of Pallas, in the county of Longford, Ireland, 10th November 1728. His father, the Rev. Charles Goldsmith, a clergyman of the Established Church, held the living of Kilkenny West. At the age of six, G. was placed under the care of the village schoolmaster, when an attack of small-pox interrupted his studies. On his recovery, he attended school at various places. On the 11th June 1745, he entered Trinity College, Dublin, as a sizar; the expense of his education being defrayed by his uncle, the Rev. Thomas Contarine. At the university—where Burke was his contemporary—G. gave no evidence of the possession of talent, and becoming involved in some irregularity, quitted his studies in disgust. He lingered in Dublin till his funds were exhausted, then wandered on to Cork, where, he being in great distress, a handful of peas was given him by a girl at a wake, the flavour of which remained for ever sweet in his memory. By his brother Henry, he was brought back to college, where, on the 27th February 1749, he received the degree of B.A. His uncle was now anxious that his nephew should enter the church; but when he appeared before the bishop, he was rejected. His kind-hearted relative then gave him £50, and sent him to Dublin to study law; but G., being attracted to a gaming-table, risked his entire capital, and of course lost it. Another sum was then raised, and he proceeded to Edinburgh to study medicine, where he remained 18 months, but did not take a degree. He then proceeded to the continent, hovered about Leyden for some time, haunting the gaming-tables with but indifferent success; and in February 1755, he left that city to travel on foot through Europe, scantily provided as to purse and wardrobe, but rich in his kindly nature and his wonder-working flute.

After taking his degree of B.M. at Padua or Louvain, G. returned to England in February 1756, when, by the assistance of Dr Sleigh, a fellow-student, he set up as a physician among the poor. He did not succeed in his profession, and he is represented as having become usher in the academy of Dr Milner at Peckham. During this period he supported himself by contributions to the *Monthly Review*. He became candidate for a medical appointment at Coromandel, but was rejected by the College of Surgeons. The clothes in which he appeared for examination had been procured on the security of Mr Griffiths, editor of the *Monthly Review;* and as G., urged by sharp distress, had pawned them, his publisher threatened him with the terrors of a jail. He had now reached the lowest depths of misery; but the dawn was about to break.

His first publication of note was an *Inquiry into the Present State of Polite Learning in Europe*, and was published in April 1759. In January 1760, Mr Newbery commenced the *Public Ledger*, to which G. contributed the celebrated *Chinese Letters*, afterwards republished under the title of *The Citizen of the World*. He also wrote a *Life of Beau Nash*, and a *History of England*, in a series of letters. On the 31st May 1761 he was introduced by Dr Percy to Dr Johnson, who, in his turn, introduced his new friend to the Literary Club. In December 1764, *The Traveller* appeared, and at once placed him in the front rank of English authors. Two years after this he published the *Vicar of Wakefield*, which has now charmed four generations. In rapid succession he produced his other works. The comedy of the *Good Natured Man*, in 1767; the *Roman History*, in 1768; and *The Deserted Village*—the sweetest of all his poems—in 1770. In 1773, his comedy of *She Stoops to Conquer* was produced at Covent Garden with great applause. His other works are—*Grecian History*, 1774; *Retaliation*, a poem, 1777; and *History of Animated Nature*, which he did not live to complete. Although now in receipt of large sums for his works, G. had not escaped from pecuniary embarrassment. He was extravagant, loved fine living and rich clothes, his charities were only bounded by his purse, and he haunted the gaming-table quite as frequently, and with as constant ill success, as of old. In March 1774, he came up to London, ill in body and harassed in mind, and took to bed on the 25th. With characteristic wilfulness and imprudence, he, contrary to the advice of his medical advisers, persisted in the use of James's Powders. He became rapidly worse, and Dr Turton said: 'Your pulse is in greater disorder than it should be from the degree of fever you have. Is your mind at ease?' 'No, it is not,' was the poet's reply, and the last words he uttered. He died on the 4th April, £2000 in debt, and more sincerely lamented than any literary man of his time. Old and infirm people sobbed on the stairs of his apartments, Johnson and Burke grieved, and Reynolds, when he heard the news, laid down his pencil, and left his studio. He was buried in Temple Church, and a monument was erected to him in Westminster Abbey, bearing an epitaph by Dr Johnson.

G. was the most natural genius of his time. He did not possess Johnson's mass of intellect, nor Burke's passion and general force, but he wrote the finest poem, the most exquisite novel, and—with the exception perhaps of the *School for Scandal*—the most delightful comedy of the period. Blundering, impulsive, vain, and extravagant, clumsy in manner and undignified in presence, he was laughed at and ridiculed by his contemporaries; but with pen in hand, and in the solitude of his chamber, he was a match for any of them, and took the finest and kindliest revenges. Than his style—in which, after all, lay his strength—nothing could be more natural, simple, and graceful. It is full of the most exquisite expressions, and the most cunning turns. Whatever he said, he said in the most graceful way. When he wrote nonsense, he wrote it so exquisitely that it is better often than other people's sense. Johnson, who, although he laughed at, yet loved and understood him, criticised him admirably in the remark: 'He is now writing a Natural History, and will make it as agreeable as a Persian tale.' The best life of Goldsmith is that by Forster, entitled *The Life and Times of Oliver Goldsmith* (Lond. 1854).

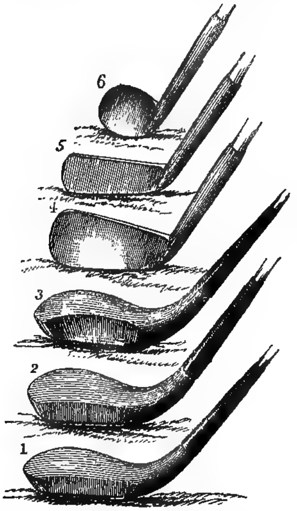
GOLDSMITHS' NOTES; the earliest form of bank-notes; so called because goldsmiths were the first bankers. See BANK-NOTES.

GOLF, or **GOFF**, a pastime almost peculiar to Scotland, derives its name from the club (Ger. *Kolbe;* Dutch, *Kolf*) with which it is played. It is uncertain when it was introduced into Scotland, but it appears to have been practised by all classes to a considerable extent in the reign of King James I. Charles I. was much attached to the game, and on his visit to Scotland in 1641, was engaged in it on Leith Links when intimation was given him of the rebellion in Ireland, whereupon he threw down his club, and returned in great agitation to Holyroodhouse. The Duke of York, afterwards James II., also delighted in the game; and in our own day, the Prince of Wales occasionally practises it.

Until late years, golf was entirely confined to Scotland, where it still maintains its celebrity as a national recreation; but latterly it has been established south of the Tweed, as well as in many of the British colonies. It is played on what are called in Scotland *links* (Eng. *downs*), that is, tracts of sandy soil covered with short grass, which occur frequently along the east coast of Scotland. St Andrews and Leven in Fife, Prestwick in Ayrshire, Musselburgh in Mid Lothian, North Berwick and Gullane in East Lothian, Carnoustie and Montrose in Forfarshire, and Aberdeen, are examples of admirably suited links, as the ground is diversified by knolls, sand-pits, and other *hazards* (as they are termed in golfing phraseology), the avoiding of which is one of the most important points of the game.

A series of small round holes, about four inches in diameter, and several inches in depth, are cut in the turf, at distances of from one to four or five hundred yards from each other, according to the nature of the ground, so as to form a circuit or *round*. The rival players are either two in number, which is the simplest arrangement, or four (two against two), in which case the two partners strike the ball on their side alternately. The balls, weighing about two ounces, are made of gutta-percha, and painted white so as to be readily seen.

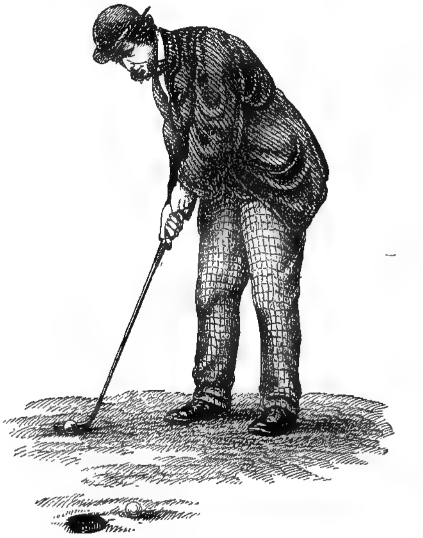
An ordinary golf-club consists of two parts spliced together—namely, the shaft and head: the shaft is usually made of hickory, or lance-wood; the handle covered with leather; the head (heavily weighted with lead behind, and faced with horn) of well-seasoned apple-tree or thorn. Every player has a *set* of clubs, differing in length and shape to suit the distance to be driven, and the position of the ball; for (except in striking off from a hole, when the ball may be *teed*—i. e., placed advantageously on a little heap of sand, called a *tee*) it is a rule that the ball must be struck as it happens to lie. Some positions of the ball require a club with an iron head. The usual complement of clubs is six; but those who refine on the gradation of implements use as many as ten, which are technically distinguished as the *play-club, long-spoon, mid-spoon, short-spoon, baffing-spoon, driving-putter, putter, sand-iron, cleek*, and *niblick* or *track-iron*—the last three have iron heads, the others are of wood. Every player is usually provided with an attendant, called a *caddy*, who carries his clubs and 'tees' his balls.



Club Heads:
1, play-club; 2, putter; 3, spoon; 4, sand-iron; 5, cleek; 6, niblick or track-iron.

The object of the game is, starting from the first hole, to drive the ball into the next hole with as few strokes as possible; and so on round the course. The player (or pair of players) whose ball is holed in the fewest strokes has gained that hole; and the *match* is usually decided by the greatest number of holes gained in one or more rounds; sometimes it is made to depend on the aggregate number of strokes taken to 'hole' one or more rounds.

To play the game of golf well requires long practice, and very few attain to great excellence who have not played from their youth. But any one may in a year or two learn to play tolerably, so as to take great pleasure in the game; and for all who have once entered upon it, it possesses no ordinary fascination. It has this advantage over many other outdoor games, that it is suited both for old and young. The strong and energetic find scope for their energy in driving long balls (crack-players will drive a ball above 200 yards); but the more important points of the game—an exact eye, a steady and measured stroke for the short distances, and skill in avoiding hazards—are called forth in all cases. Along with the muscular exercise required by the actual play, there is a mixture of walking which particularly suits those whose pursuits are sedentary—walking, too, on a breezy common, and under circumstances which make it far more beneficial than an ordinary 'constitutional.'



Putting.

In the accompanying illustration, the method of holding the club, when putting the ball into the hole, is shewn.

Golf Associations are numerous in Scotland, and in many instances the members wear a uniform when playing. Many professional players make their livelihood by golf, and are always ready to instruct beginners in the art, or to play matches with amateurs.

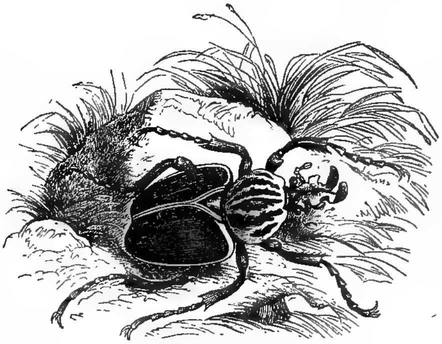
The rules laid down by the St Andrews Royal and Ancient Union Club are those that govern nearly all the other associations, and may be found in *Chambers's Information for the People*, No. 96.

GOLFO DULCE, in English, *Sweet* or *Fresh Gulf*, lies in the state of Guatemala, in Central America, measuring 26 miles by 11, and having an average depth of 6 or 8 fathoms. It communicates with the outer sea, here known as the Gulf of Honduras, by a narrow strait or stream called the Rio Dulce.

GO'LGOTHA, a Hebrew word signifying a 'skull,' and so it is interpreted by Luke; but by the other three evangelists, 'the place of a skull.' The Latin equivalent is *Calvaria*, 'a bare skull.' This place, the scene of the crucifixion of Christ, was situated without the gates of Jerusalem, on the eastern side of the city, although the common opinion handed down from the middle ages fixes it in the north-west (see CALVARY). It was probably the ordinary spot of execution, though this is to be inferred rather from the fact that, in the eyes of the Roman officers of justice, Christ was simply a common criminal, than from any supposed connection between the word 'skull' and a place of execution; G. receiving its name in all likelihood from its round skull-like form. A church was built over the spot in the 4th c. by Constantine. What is *now* called the 'Church of the Holy Sepulchre' to *the north-west* of Jerusalem, but within the walls of the city, has manifestly no claim whatever to be considered the building erected by Constantine; but while recent biblical scholars and travellers generally have assumed that the scene of our Saviour's crucifixion and sepulture is not ascertainable, a writer in Smith's *Dictionary of the Bible* offers strong reasons for believing that the present mosque of Omar, called by the Mohammedans 'The Dome of the Rock,' occupies the site of the sacred Golgotha.

GOLI'ATH. See GATH.

GOLIATH BEETLE (*Goliathus*), a genus of tropical coleopterous insects, of the section *Pentamera*, and remarkable for the large size of some of the species, particularly the African ones. They are also, in respect of their colours, splendid insects. Little is known of their habits.



Goliath Beetle (*Goliathus magnus*).

GÖ'LLNITZ, a small town in the north of Hungary, in the county of Zips, is situated on the left bank of a river of the same name, a feeder of the Hernad, 17 miles south-west of Eperies. It has important iron and copper mines, and manufactures of wire and cutlery. Pop. 5200.

GO'LLNOW, a small manufacturing town of Prussia, in the province of Pomerania, is situated on the right bank of the Ihna, 15 miles north-east of Stettin. It was formerly a Hanse-town, and is surrounded by walls, and defended by two forts. The manufactures are woollen cloth, ribbons, paper, and tobacco; there are also copper-works. Pop. 6207.

GOLOMY'NKA (*Comephorus Baikalensis*), a remarkable fish, found only in Lake Baikal, the only known species of its genus, which belongs to the goby family. It is about a foot long, is destitute of scales, and is very soft, its whole substance abounding in oil, which is obtained from it by pressure. It is never eaten.

GOLO'SHES (formerly called galoshes), from *Galoche*, a word through the French, from *Galocha*, the Spanish for a patten, clog, or wooden shoe. The French applied the term at first to shoes partly of leather and wood, the soles being wood, and the uppers of leather. The term was introduced to this country as a cordwainer's technicality, to signify a method of repairing old boots and shoes by putting a narrow strip of leather above the sole so as to surround the lower part of the upper leather. It was also adopted by the patten and clog makers to distinguish what were also called French clogs from ordinary clogs and pattens. Clogs were mere soles of wood with straps across the instep to keep them on; pattens were the same, with iron rings to raise them from the ground; but the galoshes were wooden soles, usually with a joint at the part where the tread of the foot came, and with upper leathers like very low shoes.

Now, however, these clogs, pattens, and goloshes have completely passed away except in some rural districts which are almost inaccessible to modern inventions: the American goloshes have entirely superseded them. These are manufactured of vulcanised India rubber or caoutchouc, and are now made in the most elegant forms; being elastic, they are worn as overshoes in wet weather, and are an excellent protection to the feet. At first, India-rubber goloshes were all imported from the states of America, and in 1856 the value of the imports of this article reached the enormous sum of £75,442; now, however, vast numbers are made in this country, chiefly by the North British Rubber Company (Limited), whose works are called the Castle Mills, in Edinburgh. In this vast building, when in full work, 10,500 pairs of goloshes are daily made; and so perfect is the arrangement of the manufacture, which is chiefly conducted by Americans, that in a few hours large masses of the raw material are converted into overshoes, boots, sheets, bands, rings, washers, and a great variety of other useful articles. The process of making goloshes consists, first, in preparing the raw material; secondly, kneading it up with certain chemical materials, the composition of which is carefully concealed by the manufacturers, but the principal constituent is sulphur; thirdly, rolling it out into sheets of the thickness required; and lastly, fashioning it into goloshes.

In the first operation, the rubber is first placed in warm water violently agitated; this softens it, and removes a considerable quantity of dirt and other impurities; it is then put into a machine, which tears it into very small pieces in water, thus also removing much impurity. Still warm, and somewhat adhesive in consequence, the small fragments into which the rubber has been torn are spread out into a thick sheet, which travels between two rollers about an inch apart; these press the fragments together, and they adhere slightly in the form of a thick blanket, about two feet wide, and from four to six feet in length. The slight adhesion of the very irregularly shaped morsels of rubber renders this flattened sheet very porous, and in this state it is hung in the drying-room, to remove the moisture with which it is loaded. These sheets are next passed between large cylindrical iron rollers heated with steam internally, which compress the material into thin soft sheets. The chemical materials are now spread equally over the sheet, and it is folded up and kneaded so as to work the vulcanising materials and rubber well together. This kneading process is performed by passing it several times through the hot rollers, folding it after each rolling into a dough-like mass. When this operation is completed, it is finally rolled out into thin sheets several yards in length, which are reeled off on cold rollers at some distance, so as to allow cooling, and it is then ready for the *uppers* of the commonest kind of goloshes, which are unlined; but the better sorts are lined with cotton cloth of different colours, and sometimes with other materials; the lining is effected by passing the piece of cloth through the rollers simultaneously with the rubber in the last process, and a firm adhesion of the two is effected by the heat and pressure.

Another machine has rollers so modelled that it produces a sheet thick enough for the soles, and on one surface the roughening is made by engraved lines crossing each other, to prevent the sole from slipping in wet weather. An ingenious arrangement of this machine forms about two inches of each side of the sheet which passes through it a little thicker than the middle portion, and this serves for the raised heels. After the sheets for the *uppers* and *heels* have been cooled and reeled off, they pass through the cutting machines. In these are fitted sharp cutting moulds of different sizes and shapes: some cut out the inside linings and the outside uppers for fronts and heel-steppings; whilst others with great nicety cut the heeled soles out.

These various parts are now taken to the makers, who are usually females; and the last—which is now made of cast iron as an improvement on the wooden ones formerly in use—is rapidly covered over with the various parts, beginning with the lining and insole, the edges of which are cemented with a composition probably containing liquefied India rubber or gutta-percha; but its real composition is another secret of the manufacture, and is held to be a very important one: it produces an instantaneous and firm adhesion. The outer parts and the sole are fitted on with equal facility, and the workwoman then runs a wheel-tool round the edges and other parts, to produce the representation of seam marks. In this way a pair of shoes is produced in little more than five minutes. They are next coated with a varnish, which gives them a highly polished appearance; and when the varnish has hardened, which it does very quickly, they are transferred to the vulcanising ovens or chambers, in which, for some time, they are submitted to a high degree of heat, which produces a chemical union between the caoutchouc and the other materials which were mixed in with it at the beginning of the operations. When taken from the oven, they are removed to the packing-room, and are sent in boxes to all parts of the kingdom, and to most parts of Europe, especially Germany, where they are very extensively worn. The North British Rubber Company produced nearly three million pairs of overshoes and boots in 1861.

GOLPE, in Heraldry, a Roundel purpure. It is sometimes called a *Wound*. See ROUNDEL.

GOMARISTS, or **CONTRA-REMONSTRANTS**, the name by which the opponents of the doctrines of Arminius (q. v.), the founder of the Dutch Remonstrants, were designated. The party received this appellation from its leader, Francis Gomar. This theologian was born at Bruges, 30th January 1563, studied at the universities of Strasburg, Heidelberg, Oxford, and Cambridge, in the last-mentioned of which he took his degree of B.D. in 1584. In 1594, he was appointed professor of divinity at Leyden, and signalised himself by his vehement antipathy to the views of his colleague, Arminius. In the disputation between the Armenians and Calvinists, held at the Hague in 1608, his zeal was very conspicuous; and at the synod of Dort in 1618, he was mainly instrumental in securing the expulsion of the Arminians from the Reformed Church. He died at Gröningen in 1641. An edition of his works was published at Amsterdam in 1645. G., though stiff and bigoted in the last degree, and more Calvinistic than Calvin himself, was a man of various and extensive learning.

GOMBROO'N, called also BENDER or BUNDER ABBAS, a town and seaport of Persia, stands at the mouth of the Persian Gulf, in the Strait of Ormuz, and opposite the island of that name. Bender Abbas owed its name and importance to Shah Abbâs, who, assisted by the English, drove the Portuguese in 1622 from Ormuz, or Hormuz, then a flourishing commercial town on the island of the same name, ruined the seaport, and transferred its commerce to Gombroon. For some time G. prospered abundantly, French, Dutch, and English factories were erected here, and the population rose to about 30,000. A dispute among the natives, however, resulted in the destruction of the European factories and houses, and only the remains of these now exist. Trade then almost entirely forsook G.; it is now inhabited by only about 4000 Arabs under a sheikh, who is subject to the sultan of Muscat, in Arabia. The town is surrounded by a mud wall; its streets are narrow and dirty.

GOME'RA, one of the Canary Islands (q. v.).

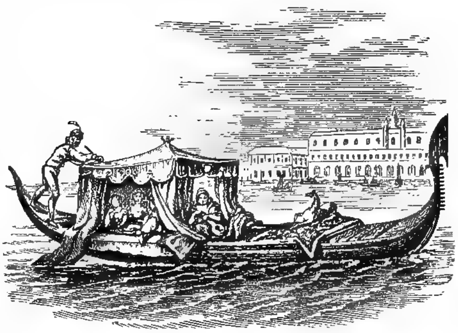
GOMO'RRAH. See Sodom and Gomorrah.

GOMU'TO, ARENG, or EJOO PALM (*Arenga saccharifera*, or *Saguerus Rumphii*), an important palm which grows in Cochin China and in the islands of the Indian Archipelago, particularly in moist and shady ravines. The stem is 20—30 feet high; the leaves 15—25 feet long, pinnated. The flowers are in bunches 6—10 feet long; the fruit is a yellowish-brown, three-seeded berry, of the size of a small apple, and extremely acrid. The stem, when young, is entirely covered with sheaths of fallen leaves, and black horse-hairlike fibres, which issue in great abundance from their margins; but as the tree increases in age, these drop off, leaving an elegant naked columnar stem. The strongest of the fibres, resembling porcupine quills in thickness, are used in Sumatra as styles for writing on the leaves of other palms. But the finer fibres are by far the most valuable; they are well known in eastern commerce as Gomuto or Ejoo fibre, and are much used for making strong cordage, particularly for the cables and standing-rigging of ships, European as well as native. Want of pliancy renders them less fit for running-rigging, and for many other purposes. They need no preparation but spinning or twisting. No ropes of vegetable fibre are so imperishable, when often wet, as those made of Gomuto fibre. At the base of the leaves of the Gomuto palm there is a fine woolly material, called *bara*, which is much employed in caulking ships and stuffing cushions. The stem contains a large quantity, 150—200 lbs., of a kind of sago. The saccharine sap, obtained in great abundance by cutting the spadices of the flowers, is a delicious beverage, and by fermentation yields an intoxicating palm wine (*neroo*), from which a spirituous liquor called *brum* is made.

GONAI'VES, a seaport of Hayti, with an excellent harbour, stands on a bay of its own name, which deeply indents the west coast of the island. It is 65 miles to the north-west of *Port Republicain*, formerly *Port au Prince*, the capital.

GO'NDAR, a city of Abyssinia, capital of the kingdom of Gondar or Amhara, is situated in lat. 12° 36′ N., and long. 37° 29′ E., on an insulated hill at an elevation of 7420 feet above sea level, and is 30 miles distant from the northern shore of Lake Dembea or Izana (see Abyssinia). G. is the residence of the emperor or *Negus*, whose authority is now merely nominal, and at one time had from 50 to 100 churches and about 50,000 inhabitants; but since the dismemberment of the kingdom, it has greatly declined, and its extent or population cannot now be accurately stated. It is poorly and irregularly built, and resembles a wood rather than a city, on account of the number of trees surrounding the houses. The palace of the emperor, a square stone structure flanked with towers, is the most important building. There are no shops or bazaars, all the articles for sale being exposed on mats in the market-place. G. has manufactures of fire-arms, sword-blades, knives, scissors, razors, shields, pottery, &c.; and a considerable transit trade between Massuah on the Red Sea and the south of Abyssinia, in slaves, musk, wax, ivory, coffee, honey, &c. The mean temperature of G., as observed by Rüppell during the seven months from October to April inclusive, was 69°, and the lowest temperature during that time was 53·09°. A great quantity of rain falls here.

GO'NDOLA (Italian), a long narrow boat (averaging 30 feet by 4) used chiefly on the canals of Venice. The prow and stern taper to a point, and curve out of the water to a height of at least 5 feet. In the centre there is a curtained chamber for the occupants: the boat is propelled by means of oars or poles by one, two, or occasionally four men. The rowers stand as they row, and wear the livery of the family to which the gondola belongs.



Venetian Gondola.

The term gondola is also applied to passage-boats having six or eight oars, used in other parts of Italy.

GONDWANA, the land of the Gonds, is a hilly tract of Hindustan, lying between 19° 50′ and 24° 30′, and in E. long. between 77° 38′ and 87° 20′. It occupies a somewhat central position, sending its drainage at once northward into the Jumna, eastward through the Mahanadi into the Bay of Bengal, and westward through the Tapti and the Nerbudda into the Arabian Sea—the water-shed in some places attaining an elevation of 5000 feet. So isolated a locality, besides being in itself unfavourable to civilisation, is rendered still more so by the extreme barbarism of the inhabitants, who are regarded, with some appearance of probability, as the genuine aborigines of India. Certain it is, that the country has never really formed a part of any of the great empires in the east.

GO'NFALON (Ital. *gonfalone*), an ensign or standard; in virtue of bearing which, the chief magistrates in many of the Italian cities were known as gonfaloniers.

GONG, an Indian instrument of percussion, made of a mixture of metals (78 to 80 parts of copper, and 22 to 20 parts of tin), and shaped into a basin-like form, flat and large, with a rim of a few inches deep. The sound of the G. is produced by striking it, while hung by the rim, with a wooden mallet, which puts the metal into an extraordinary state of vibration, and produces a very loud piercing sound.

GONGORA, Luis Y. Argote, a Spanish poet, was born at Cordova, 11th July 1561; studied law at the university of Salamanca, where he composed the greater part of his erotic poems, romances, and satires. At the age of 45, he took orders, and obtained a small prebend in the cathedral of Cordova. He was afterwards appointed chaplain to Philip III., and died in his native city 24th May 1627. G.'s poetic career divides itself into two periods. In his *first* or youthful period, he yielded himself up entirely to the natural tendencies of his genius, and to the spirit of the nation. His lyrics and romances of this period are in the old genuine Spanish style; and in respect to their caustic satire and burlesque wit, are among the most admirable specimens of the class of poems to which they belong. G., however, wished to outdo all his predecessors, and to furnish something wholly new and unheard of; the result of which unfortunate ambition was the introduction of a new poetic phraseology, called the *estilo culto*, or the 'cultivated style.' From this point the *second* period in G.'s literary career dates. To popularise the *estilo culto*, he wrote his *Polifemo*, *Soledades*, and the *Fables of Pyramus and Thisbe*, productions of the most pedantic and tasteless description, poor in invention and thought, but rich in high-sounding pompous phrases, and overloaded with absurd imagery, and mythological allusions, expressed in language of studied obscurity. In this way he became the founder of a new school, the *Gongoristas*, or *Cultoristas*, who even surpassed their master in the depravity of their literary tastes. The most complete edition of G.'s works is that by Gonzalo de Florez y Córdoba (Mad. 1633). Some of his romances have been translated into German by J. G. Jacobi (Halle, 1767).

GONIATI'TES, a genus of fossil cephalopodous mollusca, belonging to the same family as the ammonites. The genus is characterised by the structure of the septa, which are lobed, but without lateral denticulations, as in ammonites; they consequently exhibit, in a section, a continuous undulating line. Some forms with slightly waved septa approach very near to the nautilus, from which, however, they are at once separated, by the position of the small and delicate siphuncle, which is on the dorsal or external side of the shell. The lines of growth on the external surface have a sigmoid direction. The siphonal portion is shorter than the sides, forming a sinus at the back, as in the nautilus. The last chamber, the one tenanted by the animal, occupies a whole whorl, and has besides a considerable lateral expansion. The shells are small, seldom exceeding six inches in diameter.

This genus is confined to the Palæozoic strata: upwards of 150 species have been described from the Devonian, Carboniferous, and Triassic measures.

GONI'DIA (Gr. *gonē*, generation, and *eidos*, an appearance), small green bodies which in some cryptogamous plants serve the purpose of reproduction, but apparently after a manner analogous to that of bulbils in phanerogamous plants, rather than by true fructification. It is not, however, certain that the bodies called gonidia in different classes of cryptogamous plants are all of exactly the same nature. The gonidia of Lichens (q. v.) are found in layers in the interior of the thallus. In some of the lowest vegetable organisms, as *Desmidiaceæ*, the gonidia are formed by the *endochrome* or contents of the cell breaking up into granules, sometimes invested with cilia, and moving as zoospores, at first within the cavity of the cell in which they are formed, and afterwards without it.

GONIO'METER, an instrument for measuring the angles of crystals. The simplest instrument is that invented by Carangeau, which consists of two brass rulers turning on a common centre, between which the crystal is so placed that its faces coincide with the edges of the rulers, and the angle is measured on a graduated arc. For large crystals this is sufficiently accurate, but as many minerals are found crystallised only in small crystals, and as small crystals of any mineral are generally the most perfect, an instrument capable of measuring more exactly was required. The one generally in use is the reflecting goniometer invented by Wollaston, and improved by Nauman. This is a more complicated instrument, yet easy of application, and it will measure very small crystals with certainty to within a single minute (1′). The angle is measured by the reflection of the rays of light from the surface of the different faces of the crystal.

GONORRHŒ'A (*gonos*, progeny or seed, and *rheō*, I flow), a name originally applied almost indiscriminately to all discharges from the genital passages in both sexes, but especially in the male. In the course of usage, the term has been almost entirely restricted to the designation of one particular kind of discharge, which, from its connection with a contagious poison, was originally called, in strict nosological language, *G. virulenta.* This form of the disease is usually caused by the direct communication of sound persons with those already affected; and accordingly G. is one of the numerous penalties attending an indiscriminate and impure intercourse of the sexes. See SYPHILIS. G. is a very acute and painful form of disease; it is liable, however, to leave its traces in the more chronic form of gleet, which may last for a considerable time, and may give rise to alarm from being mistaken for other disorders. A description of the symptoms and cure of G. would of course be out of place in a work like the present; but we may avail ourselves of this opportunity to warn the victims of G., and the allied disorders, against consulting any but medical men of the highest standing, and of undoubted character. An unworthy class of practitioners exists, who live chiefly by inveighing and frightening the unwary, and who not unfrequently extort vast sums of money by threats of exposure of what is communicated to them in confidence. The advertisements of these men are an offence to decency, and should act as beacons to the public, rather than as they are intended.

GONVILLE AND CAIUS COLLEGE, CAMBRIDGE, was originally founded in 1348 by Edmund Gonville, son of Sir Nicholas Gonville, rector of Terrington, in Norfolk, and endowed for a master and three fellows. In 1353, William Bateman, Bishop of Norwich, whom Gonville had appointed his executor, changed the situation of the college to its present site, and altered the name to the 'Hall of the Annunciation of Blessed Mary the Virgin.' In 1558, Dr Caius obtained a royal charter, founding the college for the third time, and altering the name to that which it now bears. By the present statutes, the college consists of a master, thirty fellows, and thirty-six scholars. There are also at this college four studentships in medicine, founded by Christopher Tancred, each of the annual value of £113.

GONZA'GA, a town of Northern Italy, 14 miles south-south-east of Mantua, with 14,580 inhabitants, is the chief town of the district of Gonzaga, of which the population is 24,841. The town was formerly fortified and protected by a strong castle, and some assert that the family of Gonzaga, who ruled for four centuries over Mantua, originated in this locality. The territory surrounding G. is a well-watered and fertile plain.

GONZAGA, HOUSE OF, a princely family of German origin, from which sprang a long line of sovereign Dukes of Mantua and Montferrat. The sway of this race over Mantua extended over a period exceeding three centuries, and many of its members were magnificent promoters and cultivators of arts, science, and literature. Wielding originally in the state the vast civic influence which in so many instances we find exercised by families of weight in the history of Italy, the Gonzagas gradually monopolised all the chief posts of command, both civil and military; and finally, in 1432, were invested with the title and jurisdiction of hereditary marquises, and in 1530 with that of dukes or sovereigns of the state. After their elevation to ducal dignity, they continued to own the feudal supremacy of the empire, and were the faithful champions of the imperial interests in their policy with other states. The House of G., and that of the Visconti Dukes of Milan, were perpetually at war. The most illustrious personages of this race were GIOVANNI FRANCESCO (1407—1444), in whose favour Mantua was created a marquisate by the Emperor Sigismund, in return for his services to the empire.—GIAN FRANCESCO (1484—1519), who defeated Charles VIII. of France at the battle of Fornovo, on the banks of the Taro, 1495, when G. left 3500 troops on the field, and Charles was forced to a hasty retreat. G. also took part in the engagement of Atella, 1496, which led to the capitulation of the French forces. His son, FREDERICK II. (1519—1540), in recognition of the services he rendered the imperial forces in their contest with France, was invested by the Emperor Charles V. with the ducal dignity in 1530, and also obtained the marquisate of Montferrat in 1536. During the reign of this prince, the court of Mantua was one of the most magnificent and gay of Europe.—GUGLIELMO (1550—1587), the son of Frederick, was humpbacked, but proved a wise and enlightened ruler; his secretary was Bernardo Tasso, father of the poet.—VINCENZO (1587—1612), son of Guglielmo, was the warm friend and patron of Tasso, and succeeded in obtaining the poet's freedom, when he was confined as insane by the Duke Alfonso d'Este.—Vincenzo was much esteemed for his piety, justice, and liberality. He was successively followed by his three sons, Francesco, Ferdinando, and Vincentio, who died without heirs, and thus the direct line of the ducal branch became extinct. A collateral branch, in the person of Charles I., Duke of Nevers, son of Ludovico, the brother of Guglielmo the humpbacked, claimed the duchy, which was contested by his cousin Cæsar, Duke of Guastalla. This family feud led to a general war, in which France supported Nevers, and the empire claimed the right of adjudging Mantua, as an imperial fief, to a candidate of imperial election. Mantua in 1629 was stormed, sacked, and stripped of all its magnificent possessions, by the imperialists, and never regained its former splendour. Charles de Nevers submitted finally to the emperor, and was installed in the duchy. The artistic treasures collected for ages by the G. princes were scattered throughout Europe, and came into the possession of several of the reigning sovereigns. The successors of Charles were dissipated and silly, and the tenth and last Duke of Mantua, Ferdinand-Charles, was the most contemptible and dissolute of all. As he had countenanced the French in the War of the Succession, the Emperor Joseph I. deprived him of his states, placing him under the ban of the empire. He died in exile in 1708, leaving no issue.

GONZALVO DI CORDOVA (G. Hernandez y Aguilar), a celebrated Spanish warrior, was born at Montillo, near Cordova, in 1453. He served with great distinction first in the war with the Moors of Granada, and afterwards in the Portuguese campaign. At the close of the final contest with Granada, he concluded the negotiation with Boabdil (Abu Abdallah), king of the Moors, in such a masterly manner, that the rulers of Spain bestowed upon him a pension and a large estate in the conquered territory. He was next sent to the assistance of Ferdinand, king of Naples, against the French. In less than a year, G., with his limited resources, had conquered the greater part of the kingdom, and obtained the appellation of 'El Gran Capitano.' In conjunction with King Ferdinand, he succeeded in completely expelling the French from Italy; and in August 1498 returned to Spain, having received in return for his valuable services an estate in the Abruzzi, with the title of Duke of San Angelo. When the partition of the kingdom of Naples was determined upon by a compact entered into at Granada, 11th November 1500, G. again set out for Italy, with a body of 4300 men, and on the way took Zante and Cephalonia from the Turks, and restored them to the Venetians. He then landed in Sicily, occupied Naples and Calabria, and demanded from the French that, in compliance with the compact, they should yield up Capitanata and Basilicata. This demand being rejected, a war broke out between the two belligerent powers, which was waged with varied success. After the victory of Cerignola, in April 1503, G. took possession of Calabria, Abruzzo, Apulia, even the city of Naples itself, and then laid siege to Gaëta, but was forced to retreat before a superior force of the enemy. On the 29th December of the same year, however, he fell upon them unexpectedly near the Garigliano, and obtained a complete victory, 29th December 1503. The French army was almost annihilated; the fortress of Gaëta fell; and the possession of Naples was secured to the Spaniards. King Ferdinand bestowed the duchy of Sesa upon the conqueror, and appointed him viceroy of Naples, with unlimited authority. His good-fortune, however, made him many powerful enemies; and G. was recalled to Spain, where the king treated him with marked neglect. G. now betook himself to his estates in Granada; but after the defeat of the new viceroy in Naples by Gaston de Foix, he was again appointed to the command of the Spanish-Italian army. Mental suffering, however, had undermined the old hero's health, and on the 2d December 1515 he died at Granada.

END OF VOL. IV.

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